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Canadian Patent Office

Certification

This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,,256,944,** on December 23, 1998, by **BOMBARDIER INC.,** assignee of Berthold Fecteau, Raymond Côté, Yvon Gagné, Jean-Guy Talbot and Bruno Girouard, for "Improved Vehicle".

Agent certificateur/Certifying Officer

November 19, 1999

Date

Canada

(CIPO 68)

OPIC CIPO

ABSTRACT

A new improved recreational vehicle is provided. The vehicle is adapted for use as a snowmobile or an all-terrain vehicle. A typical unibody tunnel type snowmobile chassis is reinforced by pyramidal upper support frame members to withstand the rigors of all-terrain use. Furthermore, the vehicle is shorter than a typical snowmobile in order to position the driver and engine closer to the midpoint of the vehicle, which is necessary for all terrain vehicle manoeuvrability and control. The rear suspension has a unique system of linkages which make it suitable for chain drive and wheels or a snowmobile track and track rail.

IMPROVED VEHICLE

Field of the Invention

This invention relates to recreational vehicles and more particularly to a snowmobile which is easily convertible to an all terrain vehicle which again can be convertible back to a snowmobile.

Background

Amateurs of recreational vehicles spend time on their vehicles in both winter and summer. In winter a snowmobile having a track and pair of skis is generally used and in the summer the same enthusiasts switch to an all terrain vehicle which is capable of going over rough terrain in forests and the like. In recent years the cost of snowmobiles and all terrain vehicles has risen dramatically as such vehicles improve in terms of style, power and reliability. Furthermore, the vehicles themselves are larger. Storage space being a factor, many enthusiasts are not only unable to afford two vehicles but simply do not have the space to store one of the vehicles in the off season. With these things in mind, the present inventors sought to produce an improved vehicle which was manoeuvrable on both snow and bare land through a simple conversion.

Unfortunately, a typical snowmobile unibody frame or chassis is not strong enough to withstand the rough use which an all terrain vehicle must endure. Furthermore, an all terrain vehicle chassis or frame does not have the tunnel formation necessary to convert it to a snowmobile. In addition, the positions of the engine and driver in a typical snowmobile is forwardly and rearwardly respectively.

However, in an all terrain vehicle the driver's center of gravity must be between the front and rear axles otherwise poor handling and poor manoeuvrability occurs.

SUMMARY OF THE INVENTION

The inventors of the present invention thereby set out to construct a vehicle which incorporated a frame, a seat position, and a front and rear suspension suitable for both a snowmobile and an all terrain vehicle.

Unanticipated by the inventors, their snowmobile which is shortened so that the rider sits forwardly and the engine is moved rearwardly turned out to have high manoeuvrability and was just as stable or more so than the prior art type snowmobiles. Therefore, this invention seeks to provide an improved recreational vehicle adapted for use on snow or bare ground; said vehicle being shorter in length than a prior art snowmobile; said vehicle being constructed such that an operator is positioned forwardly, and an engine is placed rearwardly such that in operation, said engine and said operator are located close to the midpoint of the vehicle. This invention further seeks to provide a vehicle including a unibody rear chassis and an upper support structure, said rear chassis including a tunnel adapted to permit a chain drive or track move therethrough; said upper support structure including a plurality of frame members thereby providing additional strength to the vehicle for all terrain use.

Another embodiment of the invention is a new stabilizer bar arrangement on the front suspension whereby the stabilizer bar runs through, on each end, a plastic block or stabilizer block. The block not only pivots but moves

inwardly and outwardly such that if one ski rises the other will rise also.

The present invention uses a new unitary front sub-frame assembly which is attached to the main frame and which basically houses the front suspension components. The rear of the main frame is the standard unibody frame with a tunnel therein which permits the mounting of either a chain drive or track.

The sub-frame and rear unibody tunnel-type frame are connected together with various stabilizer bars and lateral supports to produce a very solid frame capable of the abuse of all terrain driving.

Because the snowmobile body is shortened considerably, a snow flap is necessary to cover the rear part of the track. This snow flap is capable of substantial movement depending upon the compressed or extended state of the rear suspension.

The vehicle also uses a new type of cradle arrangement as an engine mount. The engine can be affixed to the engine mount out of the vehicle and then during assembly the entire engine and engine mount are manoeuvred into the frame and secured thereto.

The vehicle also has another feature. When using the vehicle as an all terrain vehicle only one seat is provided and the portion of the body behind the seat normally present during snowmobile use is removed and a mud guard-type fender installed in its place. Also capable of being installed in the place of the rear portion of the snowmobile body is a second seat which permits the addition of another rider.

The improved vehicle also has a track and rear suspension with more vertical play. This allows for the required vertical compression and extension for an all terrain vehicle rear suspension.

Another improvement is the addition of a chain drive to act as a braking system for the all terrain vehicle, since normally in a snowmobile the braking system is arranged on the track.

Brief Description of the Drawings

The invention will be more fully described in conjunction with the following drawings wherein:

Fig. 1 is a schematic side view of a driver operating a prior art snowmobile in a normal seated position;

Fig. 2 is a schematic side view of a driver operating a prior art snowmobile in a forward leaning racing position;

Fig. 3 is a schematic side view of a driver operating a prior art all terrain vehicle in a normal seated position;

Fig. 4 is a schematic side view of a driver operating a motorcycle in a normal seated position;

Fig. 5 is a schematic side view of a driver operating a snowmobile of the present invention in a normal seated position.

Fig. 6 is a schematic side view comparing a driver's position on a prior art all terrain vehicle and a driver's position on a snowmobile of the present invention;

Fig. 7 is a schematic side view comparing a driver's position on a prior art motorcycle and a driver's position on a snowmobile of the present invention;

Fig. 8 is a schematic side view comparing a driver's position on a prior art Harley Davidson Cruiser with a driver's position on the snowmobile of the present invention.

Fig. 9 is a schematic side view comparing a driver's position on a prior art snowmobile and a driver's position on the snowmobile of the present invention;

Fig. 10 is a schematic side view of a driver sitting on a snowmobile of the present invention;

Fig. 11 is a perspective view of the unibody frame of the present invention;

Fig. 12 is another perspective view of the unibody frame of the present invention;

Fig. 13 is a perspective view of the unibody frame of the present invention with additional structural supports;

Fig. 14 is a perspective view of ski leg of the present invention;

Fig. 15 is various views of a lower front support arm;

Fig. 16 is a partial view of the frame of the present invention and part of the left front suspension;

Fig. 17 is a perspective view of parts of the front suspension;

Fig. 18 is a perspective view of the sub-frame of the front

suspension;

Fig. 19 is a perspective view of the front suspension of the present invention;

Fig. 20 is a perspective side view of partially completed vehicle of the present invention;

Fig. 21 is a perspective front view of a partially completed vehicle of the present invention;

Fig. 22 is a front view of a partially completed vehicle of the present invention;

Fig. 23a is a schematic side view of the basic components of the rear suspension of the present invention in a compressed state;

Fig. 23b is a schematic side view of the basic components of the rear suspension of the present invention in a relaxed or extended state;

Fig. 24a is a schematic side view of the rear suspension (in a compressed state) for use when it is equipped with wheels;

Fig. 24b is a schematic side view of the rear suspension (in an extended state) for use when it is equipped with wheels;

Fig. 25a is a schematic side view of the basic components of the rear suspension in a compressed state for use when it is equipped with a track;

Fig. 25b is a schematic side view of the basic components of the rear suspension in an extended state for use when it is equipped with a track;

Fig. 26a is a schematic side view of the components of the rear suspension in a compressed state when it is equipped with a track rail;

Fig. 26b is a schematic side view of the components of the rear suspension in an extended state when it is equipped with a track rail;

Fig. 27 is a schematic side view showing rear suspension movement between an extended state and a compressed state;

Fig. 28 shows a rear passenger seat and a rear end body portion in perspective view; and

Fig. 29, 30, 31, and 32 are various copies of photographs of the all terrain vehicle and snowmobile of the present invention.

Detailed Description of the Invention

In Fig. 1, one notes a man sitting to the rear of the seat in the dark outline shown as (A). He is seated on a prior art know snowmobile. One notices the weight of the rider is over the rear section of the track. The motor (not shown) is located over the skis.

In Fig. 2, the operator is leaning forward in a racing position as shown in outline (B). Thus, the weight of the driver is slightly forward which is more useful in doing tight turns and other manoeuvres.

In Fig. 3, a driver is shown on a prior art all terrain vehicle (2). His body position is in outline marked (C). The driver is considerably further ahead on the vehicle than prior art snowmobiles. Thus, his center of gravity is closer to the midpoint between the wheels.

In Fig. 4, a driver is shown in outline (D) sitting on a standard motorcycle marked (3). The driver is even further forward with regard to the

center of gravity of the vehicle.

In Fig. 5, a driver is shown in outline (E) as seated upon the snowmobile of the present invention shown as (4). The driver is seated considerably ahead of a driver's position on a normal snowmobile and closer to the midpoint of the vehicle.

In Fig. 6 the outline of the snowmobile of the present invention is in dotted lines and shown as (4). This is compared to a standard all terrain vehicle (2) which is shown in solid lines. The driver's position (E) on the snowmobile of the present invention and (C) on an all terrain vehicle of the prior art type are almost identical. Thus, in the snowmobile of the present invention, the driver is seated approximately in the same position as on a normal all terrain vehicle.

In Fig. 7, a standard prior art motorcycle is shown in solid lines (3) and the driver position as marked as (D). The snowmobile of the present invention is in dotted lines marked as (4) and the driver's position is (E). Thus, the driver's position is somewhat rearwardly of a normal driver's position on a motorcycle.

Fig. 8 shows a driver in a position (A) in dotted lines on a prior art snowmobile (1) outlined in dotted lines. This is compared to a driver's position (F) on a prior art stretch motorcycle (5).

Fig. 9 compares a prior art snowmobile in solid lines marked as 1 with a snowmobile of the present invention in dotted lines marked (4). The driver (A), in solid lines, is sitting on the prior art snowmobile (1) and the driver (E) in dotted lines seated on the snowmobile of the present invention (4). One notes a

significant difference in the positions of the two drivers. Driver (E) is much further ahead and closer to the center of the vehicle. In addition, the new vehicle (4) is considerably shorter in length than the old snowmobile (1).

The present invention is shown in greater detail with its component parts commencing with Fig. 10. In Fig. 10, there is a unibody frame (10). The driver is on a seat (11) and is holding on the handle bars (13) of the steering column (12).

In Fig. 10, there is a shock absorber (14) of the front suspension. The ski leg (15) which is used for not only supporting the ski assembly (16) but also wheels (not shown in Fig. 10) is also shown. The engine (17) is placed on a cradle-type engine mount shown as (18). This is done during production. It is then with the use of pins or brackets or screws (21) affixed to the frame.

There are a pair of drive shafts (19) and (20). An endless belt or track (9) is held in place and revolves about the track rail (22). The track rail (22) is suspended using linkage (24) and a shock absorber (23). The track (9) circles around the rear idler wheel (25). The rear track cover (26) is pivotable up and down depending upon whether the rear suspension is in a compressed or extended state.

In Fig. 11 and 12 are perspective views of the unibody chassis or frame (10). A tunnel area (27) is shown with a curved arrow and indicates the area where the track (9) or chain (52) of the present invention travels.

In Fig. 13 some structural components have been added to the frame in the form of lateral side braces (28a and 28b). There is also a right front frame

member (30a) and a left front frame member (30b). Cross braces (29 and 33) strengthen the frame. A horizontal flange (32b) is shown which forms the basis of the foot well. A left lateral flange (31b) has also been attached. This upper metallic structure increases the torsional rigidity and the resistance to flex of the unibody.

In Fig.14 unitary cast ski leg (15) is used to provide attachment for wheels when the vehicle is used as an all terrain vehicle and skis when used as a snowmobile.

Fig. 15 shows various views of the lower front suspension support arms (34). There is in fact a lower left front suspension support arm (34b) and a lower right front suspension support arm (34a). Support arm anchors (35) are also shown.

In Fig. 16, further structural components are shown. There is a left front strut (36b) and a right front strut (36a) which connect to the frame at cross brace (29). These struts attach to front suspension cross brace (37) at either end. Each end of cross brace (37) is attached to a shock absorber (14).

The basic components of the front suspension are shown clearly in Fig. 17. There is a lower left suspension support arm (34b), a lower right suspension support arm (34a), an upper right suspension support arm (38a) and an upper left suspension support arm (38b). Bushings (41) are seen. A stabilizer bar (39) has been added and is adapted to slide and pivot by way of pivot blocks (40a and 40b). These blocks slide about the lower suspension arms (34a and 34b).

In Fig. 18 one views the front sub-assembly frame (42).

Fig. 19 shows the front suspension in a near complete condition. The sub-frame (42) connects together the various support arms and also supports a steering gear box (44) which connects to a steering rod (43). The steering gears (44) are adapted to move by steering column (12).

Fig. 20 shows the front suspension in a near completed condition with the exception of the steering rod (43) which has not yet been connected. A crank shaft (45) is visible through an aperture in the side of the unibody frame (10).

Fig. 21 shows the chassis and suspension basically completed. Most of the suspension force is transferred by way of a pyramidal structure to a common point, i.e. at cross-bar (27).

The pyramidal structure of transmitted force from the suspension is more evident in Fig. 22. Again in Fig. 22 one sees the stabilizer bar sliding blocks (40a and 40b) which hold the ends of the stabilizer bar (39). The stabilizer bar sliding blocks move along lower suspension support arms (34b and 34a).

In Figs. 23A and 23B, the rear suspension, adapted for an all terrain vehicle is shown. In Fig. 23A the suspension is shown in the compressed position and in Fig. 23B it is in the extended position. There is a rear suspension support arm (46) attached to a rear axle (47). There is a first linkage (48), a second linkage (49) and a third rear suspension linkage (50). These are adapted to attach to a shock absorber (23). A front linkage (56) is also shown.

Figs. 24A and 24B show the rear suspension linkage adapted to a

chain drive. There is a driving sprocket (51), a chain (52), an upper idler sprocket (53) and a lower idler sprocket (54). The chain attaches around a driven sprocket (55) which connects to the rear axle for movement. In Fig. 24A the suspension is in the compressed position and in Fig. 24B it is in the extended position.

In Figs. 25A and 25B a similar type of rear suspension is shown. However, the linkage is somewhat different as it is equipped for use with a snowmobile having a track at the rear-end rather than wheels. Again, there is a support arm (46), the first linkage (48), the second linkage (49 and 50), and the front linkage (56). The shock absorber (23) is also present. One notes however, that the linkage (48) is attached at a different position on the lower part of the axle. This is necessary for the snowmobile track function. Again, Fig. 25A is a suspension in the compressed state and in Fig. 25B it is in the extended state.

In Figs. 26A and 26B, the suspension is adapted for a snowmobile. Again there are the three linkages (48, 49 and 50), the front linkage (56), and the shock absorber (23). There is also the rear idler wheel (25) as well as idler wheels (57, 58 and 59).

One notes that the idler wheels in Figs. 26a and 26b ride about the track rail (22). The rear idler wheel (25) is attached to rear idler lift arm (60) which is pivotally mounted to the unibody frame.

In Fig. 27, one views the rear snowmobile suspension in two positions, the extended and the compressed positions. One notes the rear idler lift arm (60) is attached to the snow cover or snow flap (26).

In Fig. 28, there is shown a removable rear body portion (61) which

is attached behind the driver's seat. This removable rear body portion is removed and replaced by a mud guard fender assembly (not shown) when the vehicle is used as an all terrain vehicle. In the event that a second seat is required for a passenger during snowmobile operation, seat (62) is placed in the same position as the removable rear body portion (61). Seat (62) has a foot rest (63) and a seat back (64).

In Figs. 29, 30, 31 and 32 the improved vehicle of the present invention is shown in photographs at various stages of completion. As seen in Fig. 30 and particularly TP01, the snowmobile and the all terrain vehicle are shown with an identical frame and chassis. The all terrain vehicle appears shorter simply because the rear seat has been removed. In Fig. 32 photograph TP5, one notes the mud guard has replaced the end portion of the snowmobile body.

THE EMBODIMENTS OF THE INVENTION FOR WHICH AN EXCLUSIVE PROPERTY OF PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An improved recreational vehicle adapted for use on snow or bare ground; said vehicle being shorter in length than a prior art snowmobile; said vehicle being constructed such that an operator is positioned forwardly, and an engine is placed rearwardly such that in operation, said engine and said operator are located close to the midpoint of the vehicle.

2. A vehicle as claimed in claim 1 including a unibody rear chassis and an upper support structure, said rear chassis including a tunnel adapted to permit a chain drive or track move therethrough; said upper support structure including a plurality of frame members thereby providing additional strength to the vehicle for all terrain use.

3. A vehicle as claimed in claim 2 including a front suspension; said front suspension adapted for use with a pair of skis or a pair of wheels, said front suspension including a pair of ski legs adapted to be connected to said wheels or said skis.

4. A vehicle as claimed in claim 2 including a rear suspension; said rear suspension comprising a support arm, a plurality of linkages, and at least one (1) shock absorber; said suspension being adapted for use with a snowmobile track,

or a chain drive and a pair of wheels.

5. A vehicle as claimed in claim 2 including a removable rear end body portion; said rear end body portion being in operation removed for all terrain vehicle use and replaceable by a fender/mud guard assembly; said end body portion also replaceable with a rear seat assembly, when said vehicle is used as a snowmobile.

6. A vehicle as claimed in claim 1 including a removable engine mount cradle, said cradle adapted to be connected to said engine during assembly line operation and thereafter placed into said vehicle and fixedly attached thereto.

7. A vehicle as claimed in claim 1 further including a pivotal snow track guard cover; said cover being mounted to said vehicle when said vehicle is equipped with a snowmobile track.

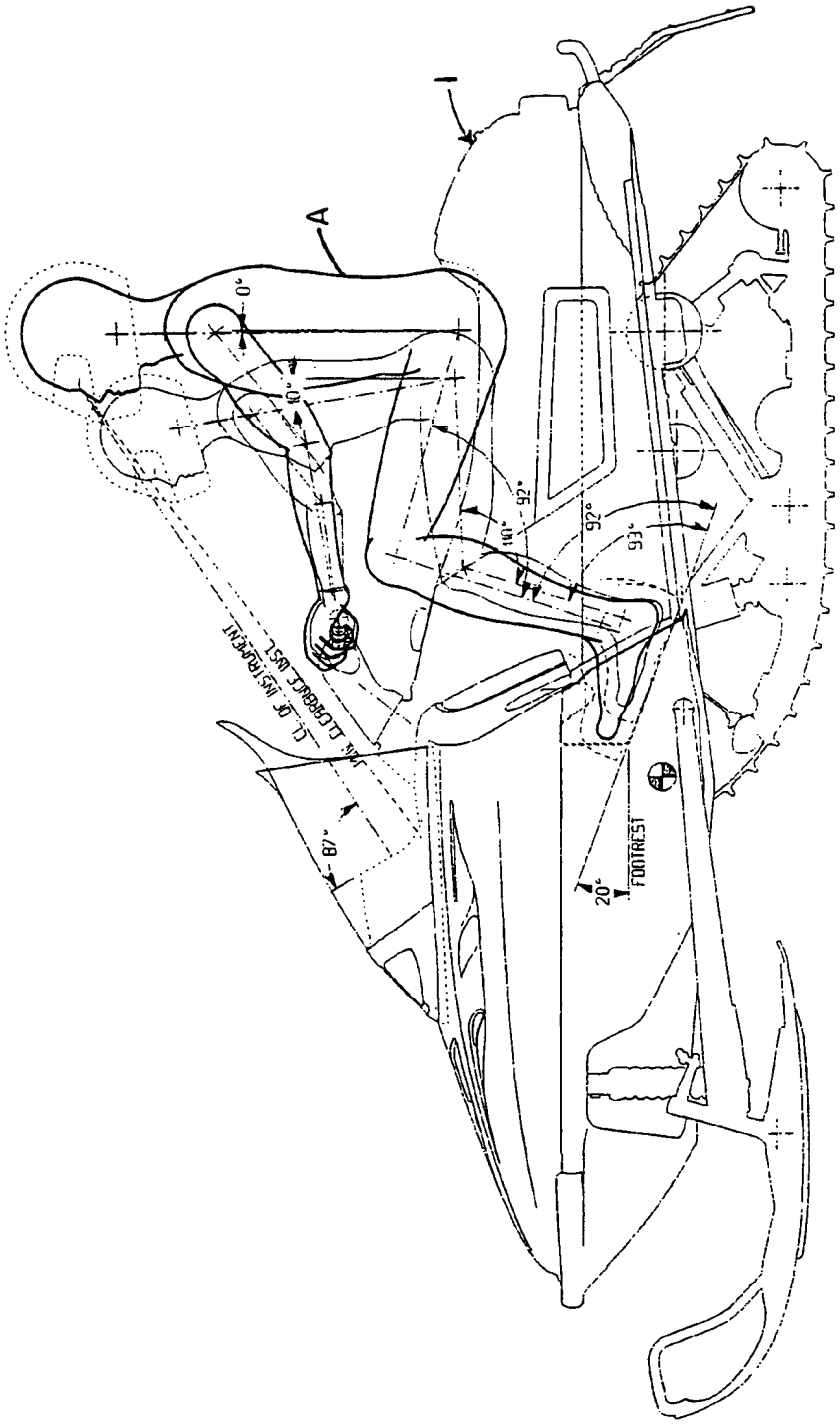

FIG. 1

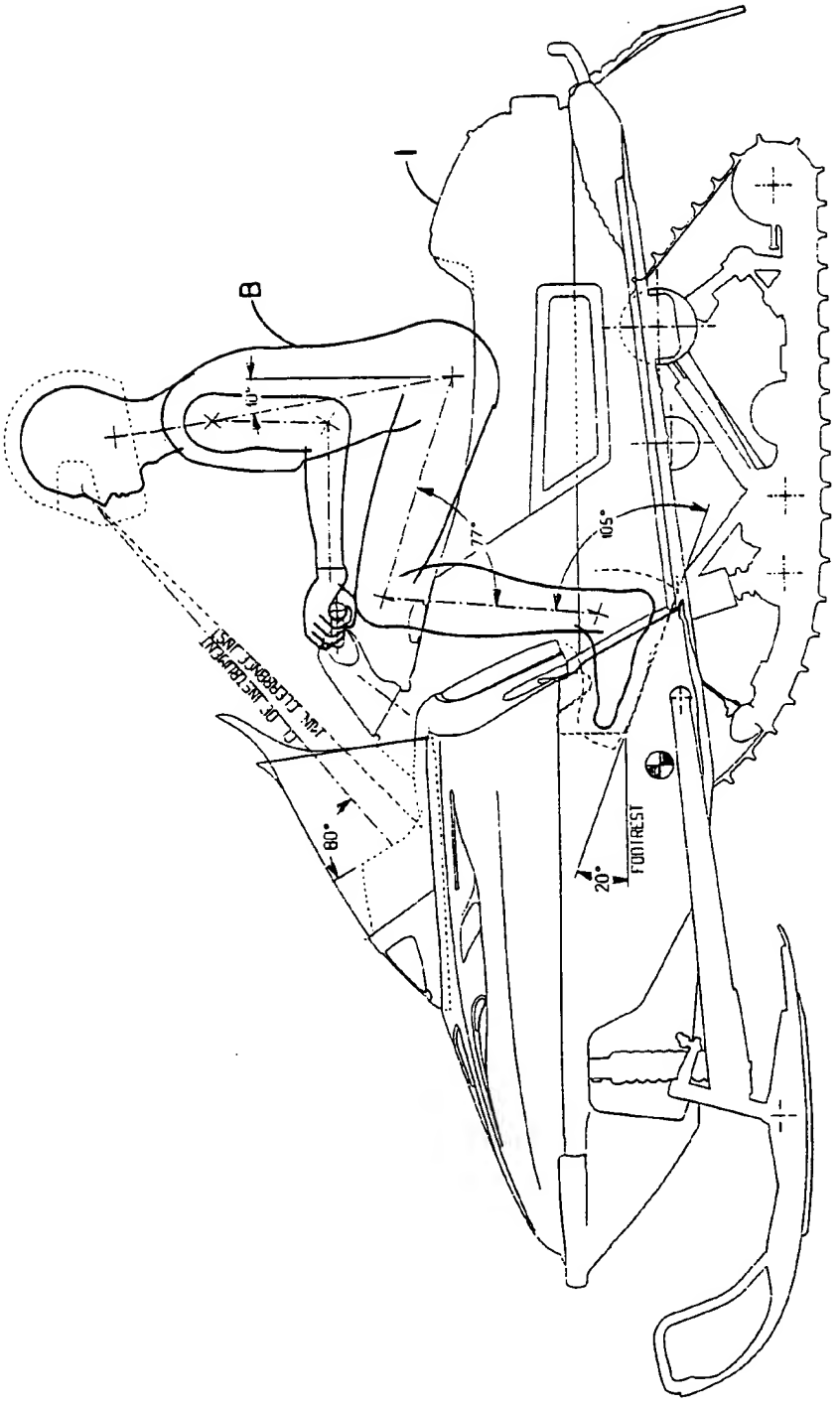

FIG. 2

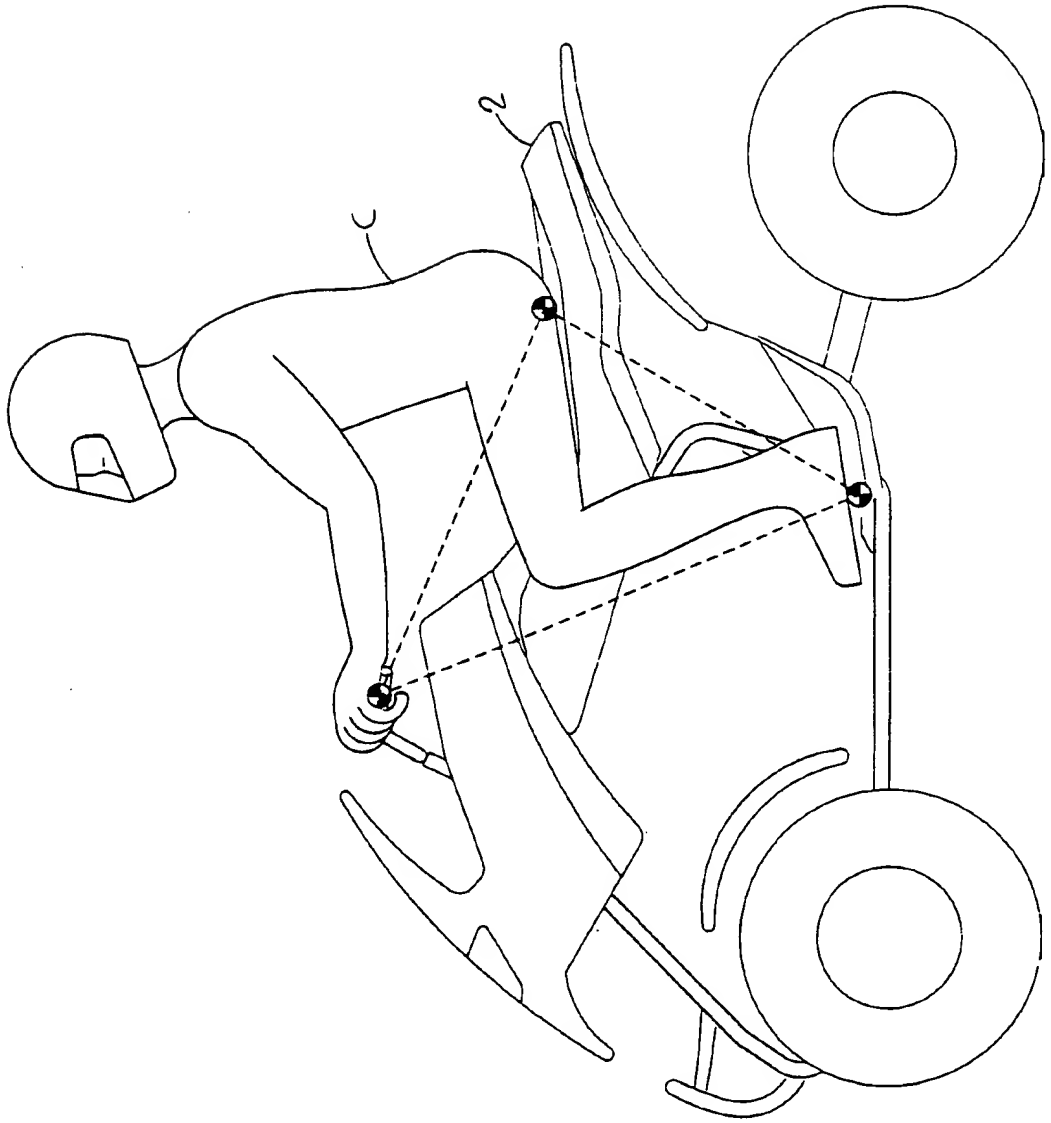

FIG. 3

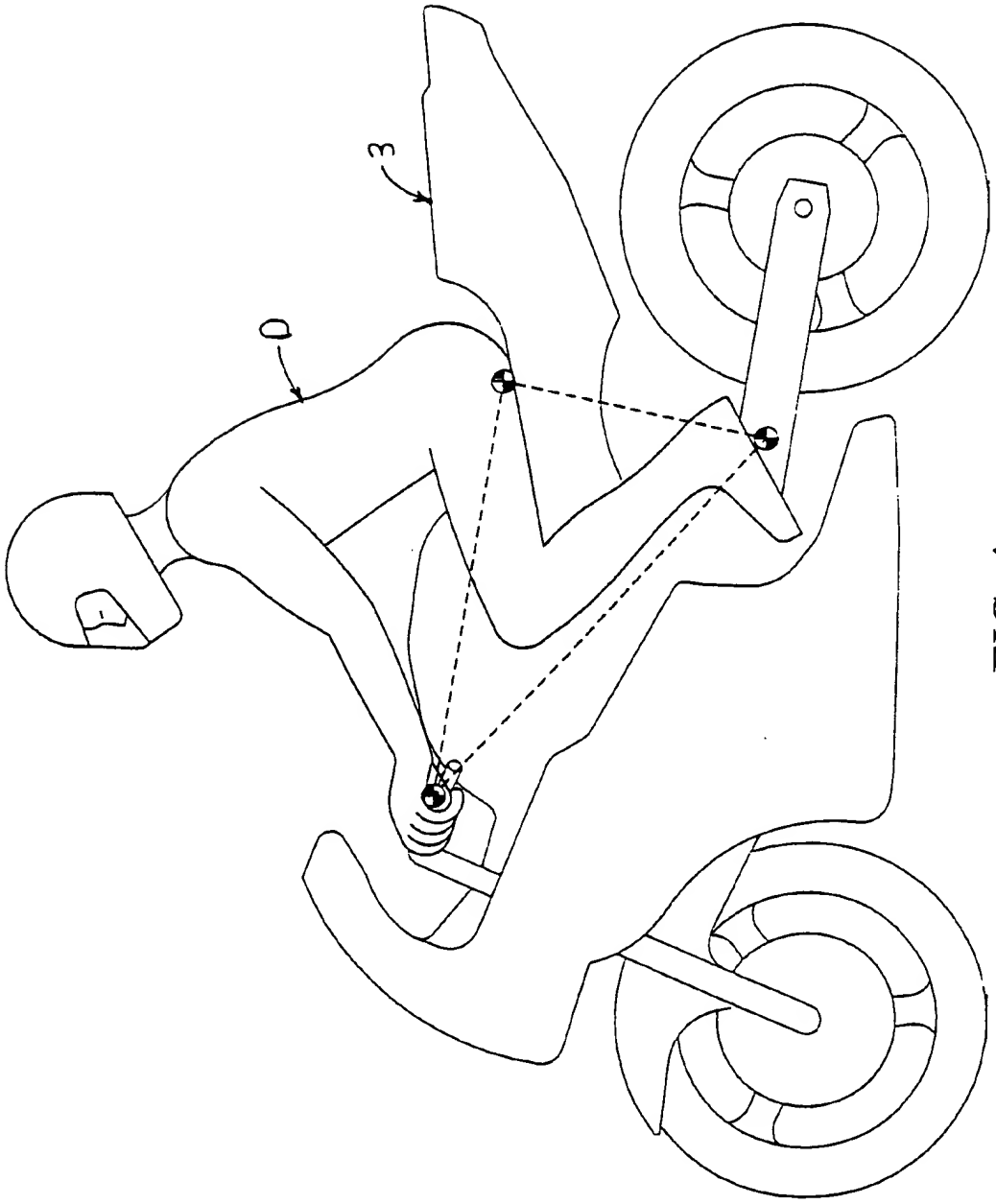

FIG. 4

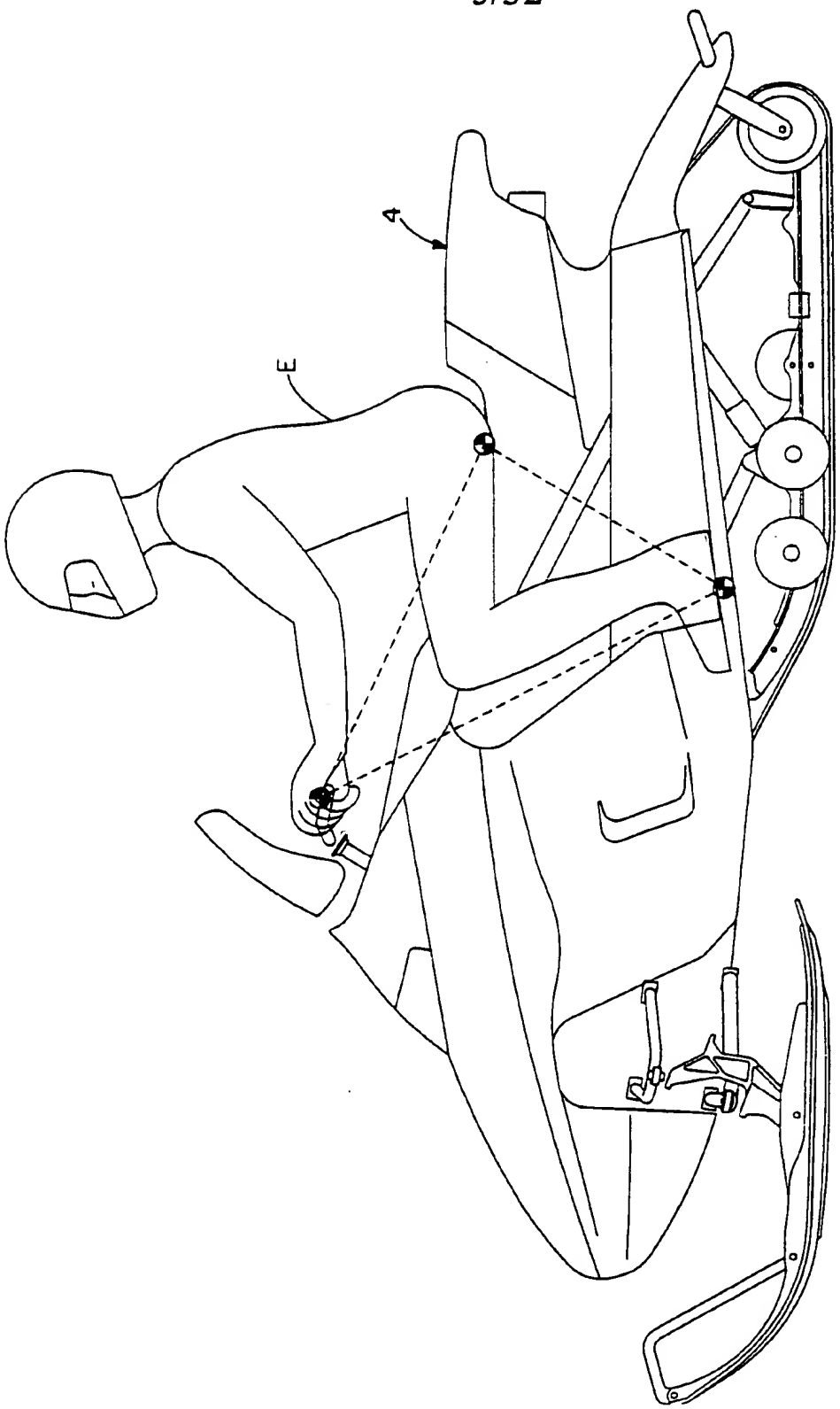

FIG. 5

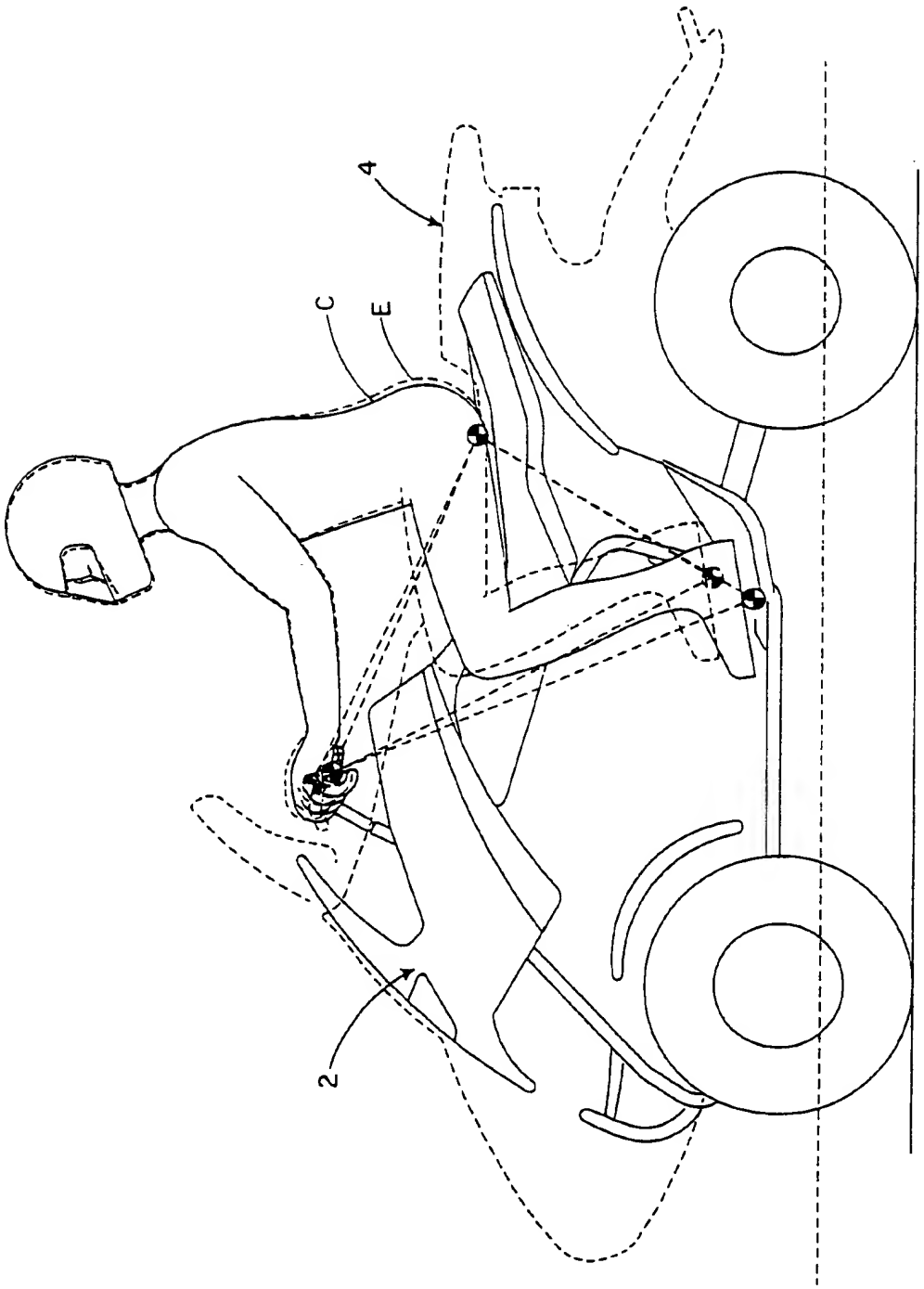

FIG. 6

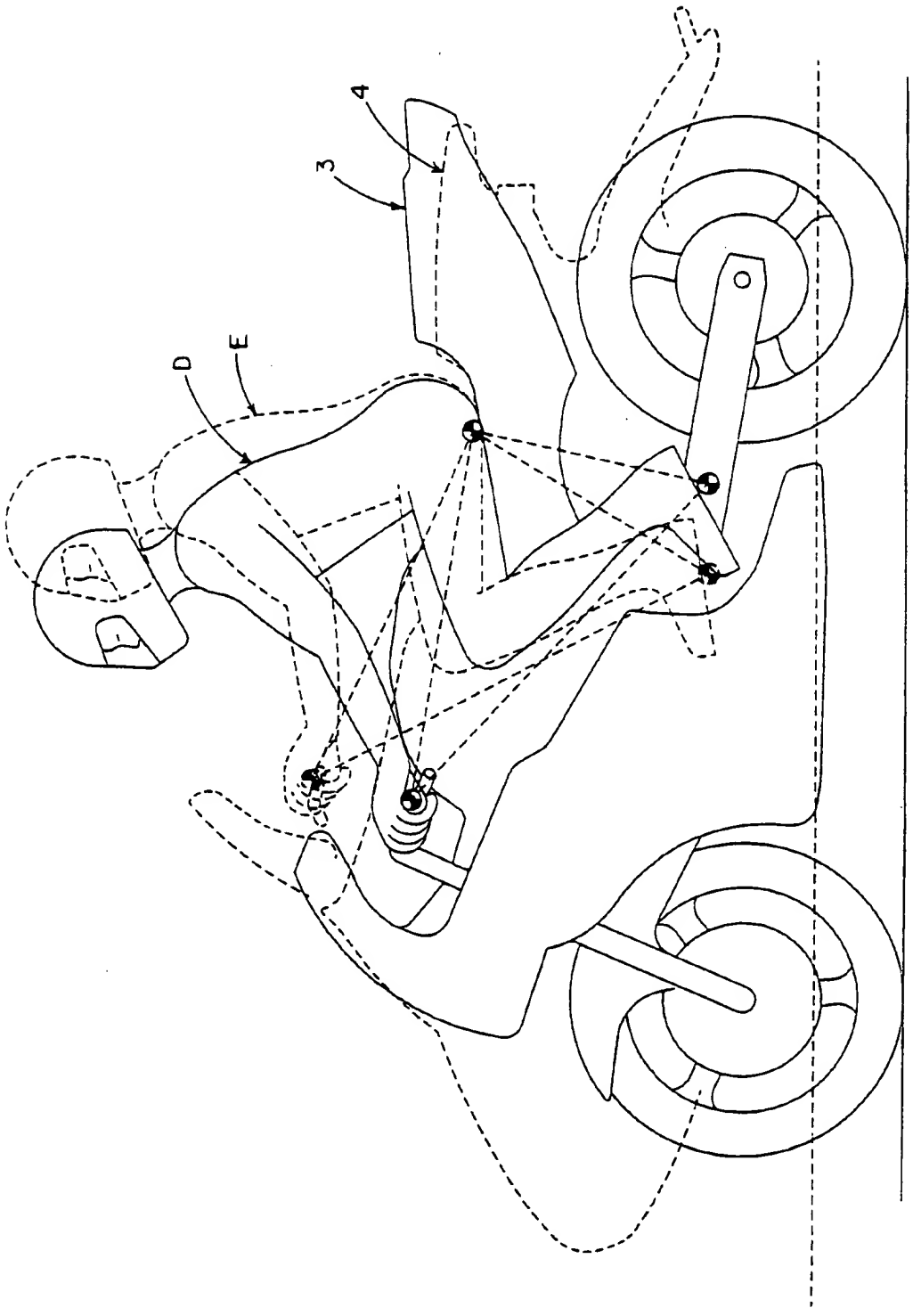

FIG. 7

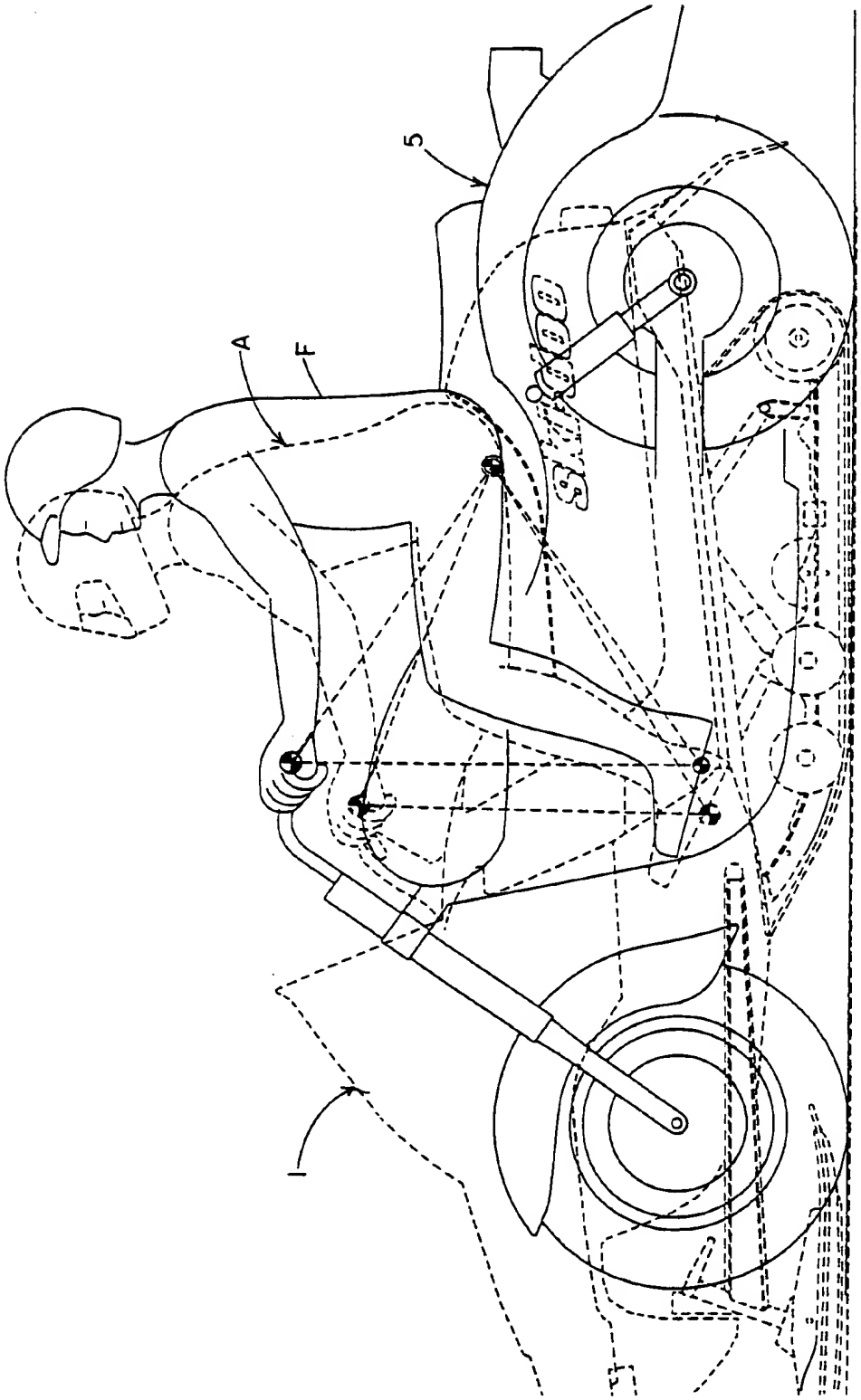

FIG. 8

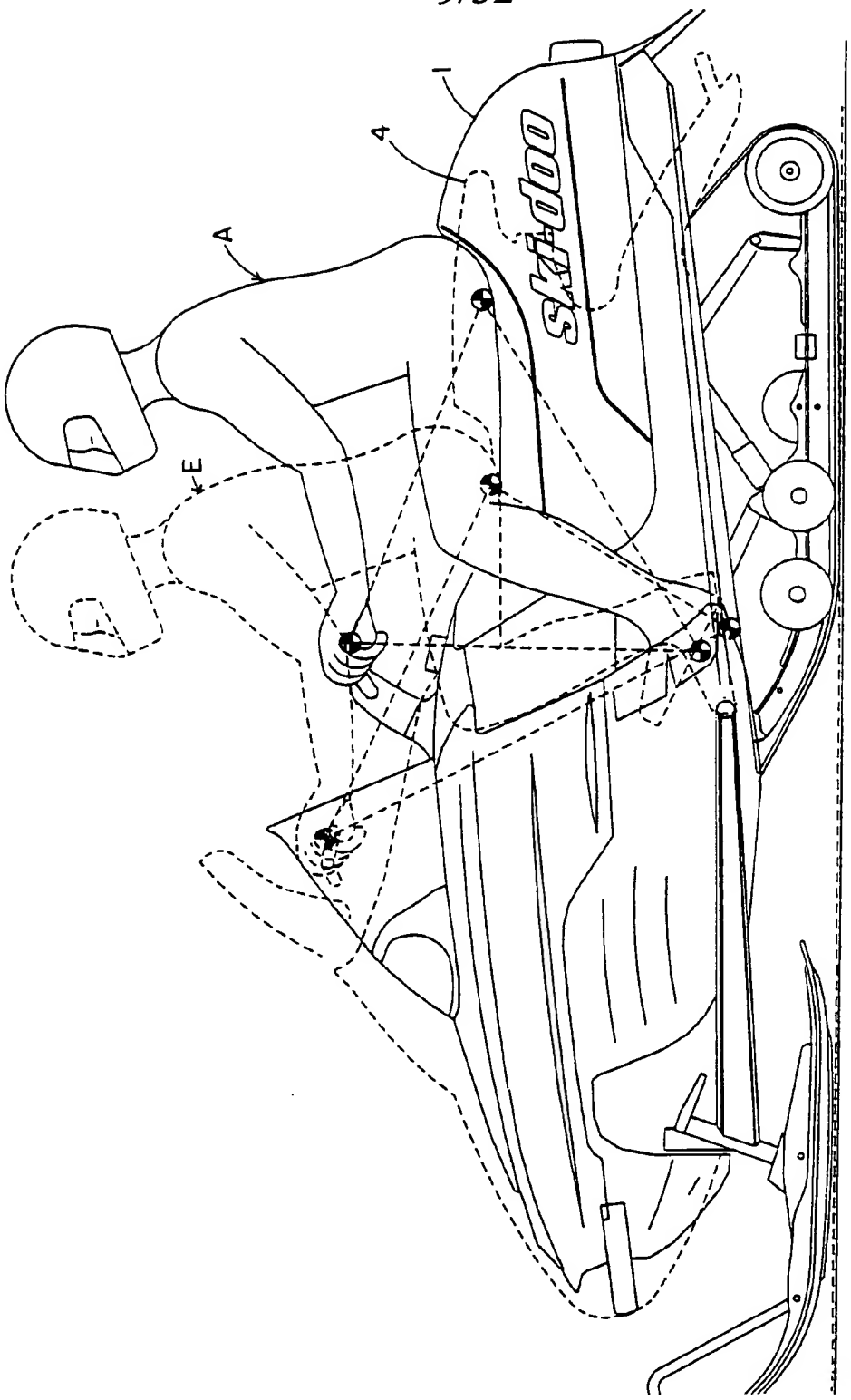

FIG. 9

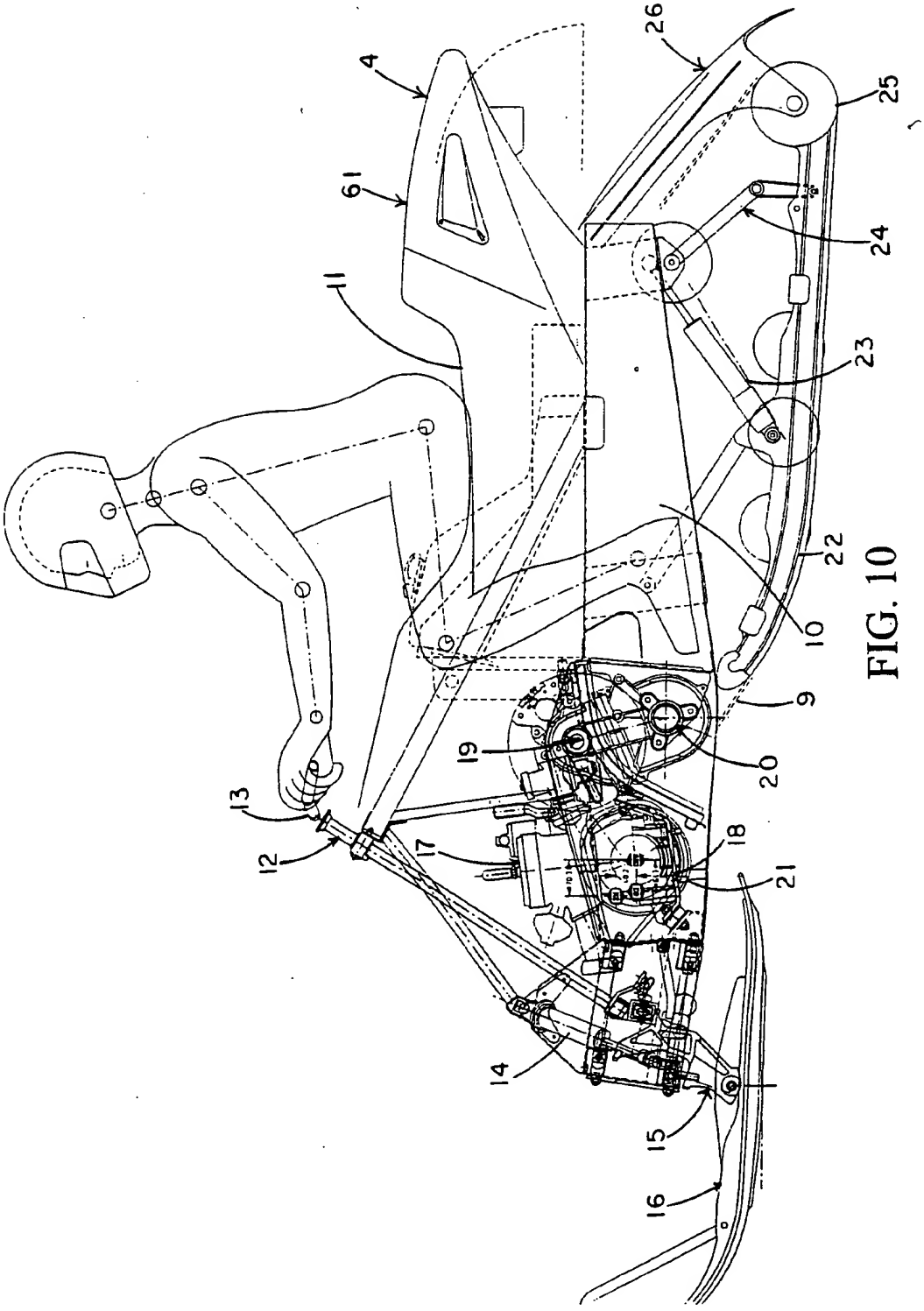

FIG. 10

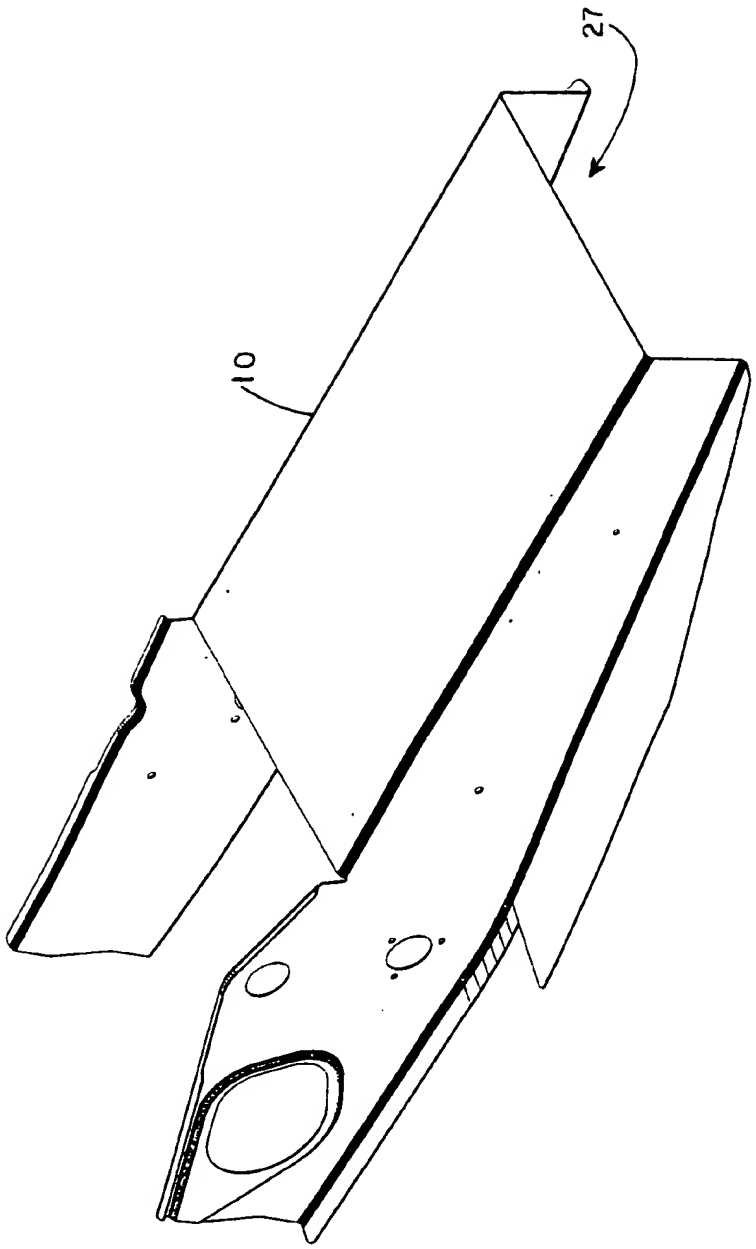

FIG. 11

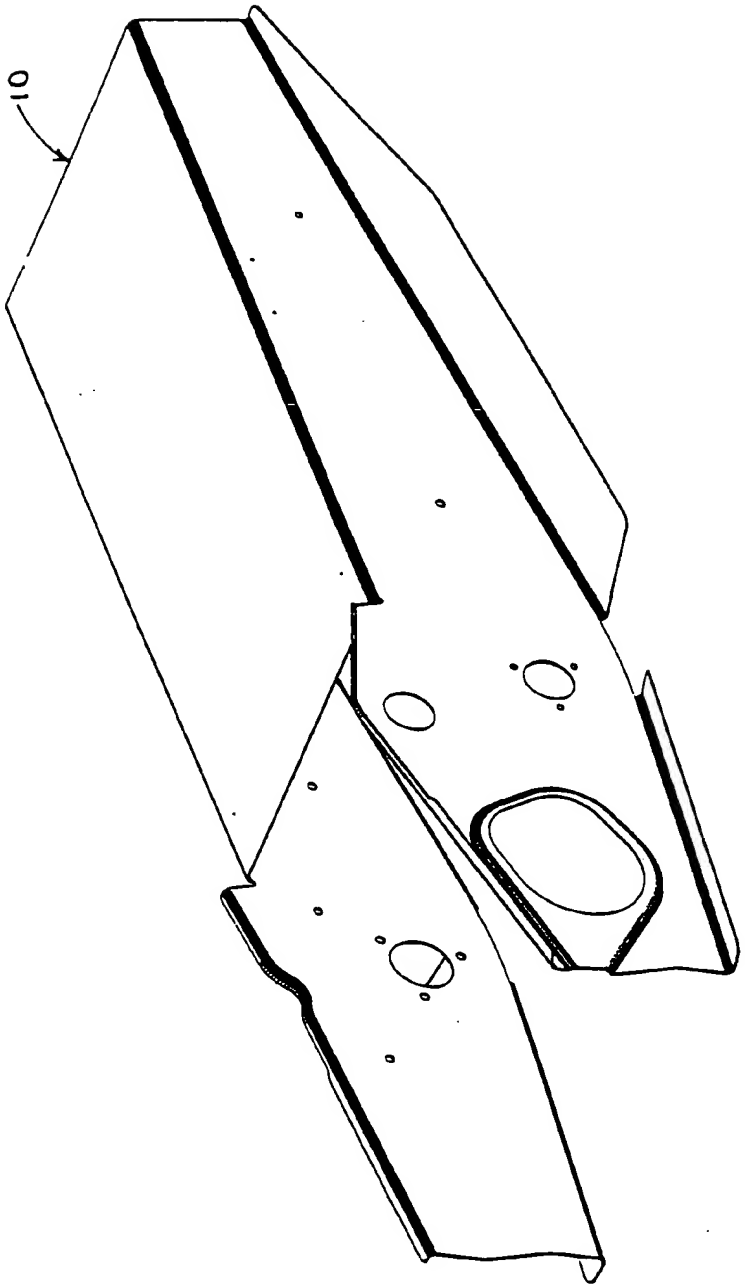

FIG. 12

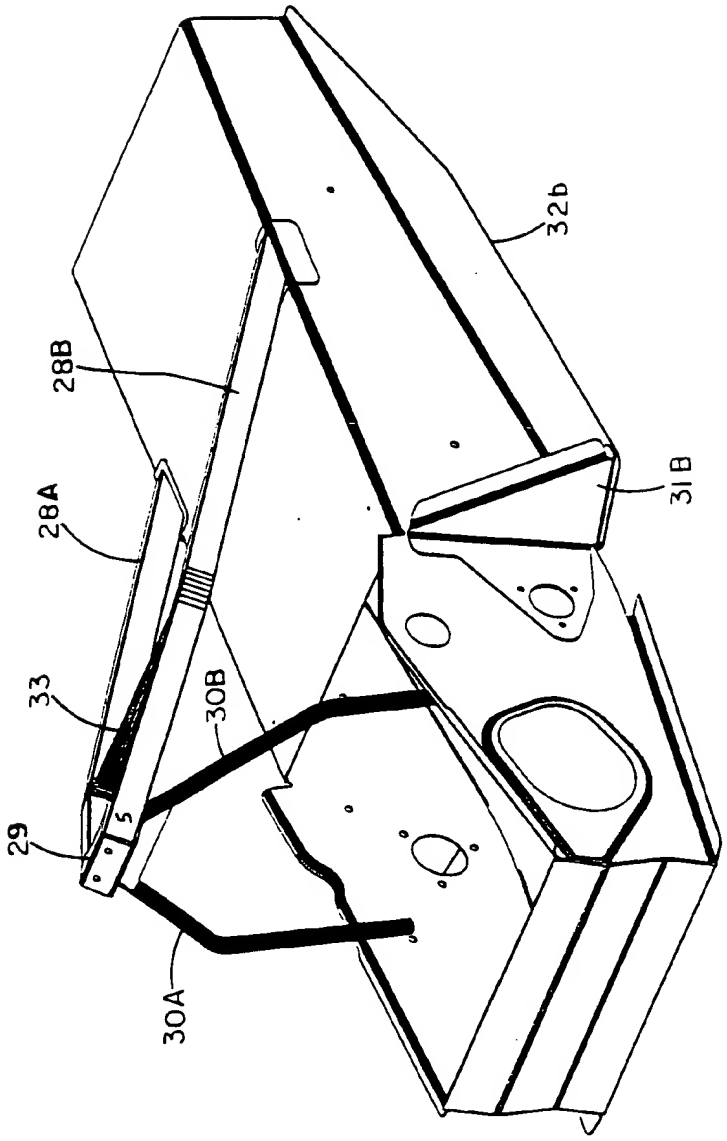

FIG. 13

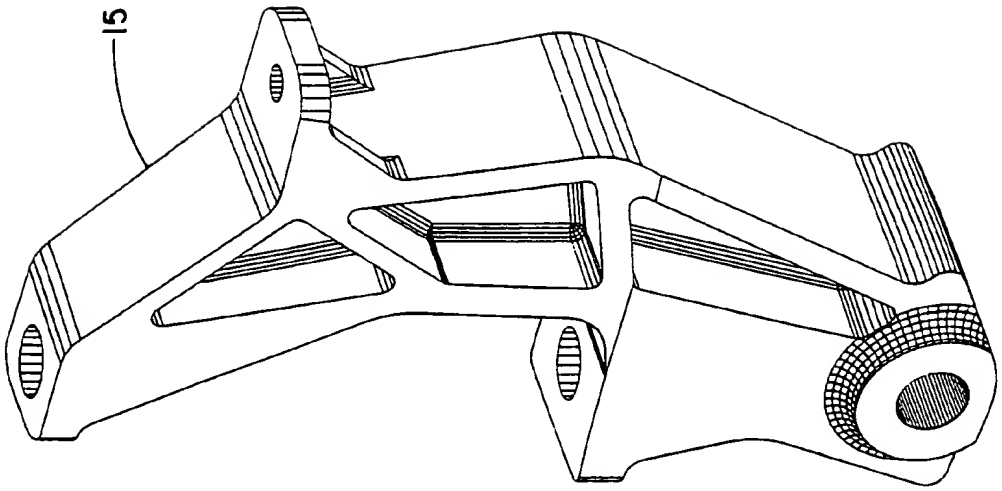

FIG. 14

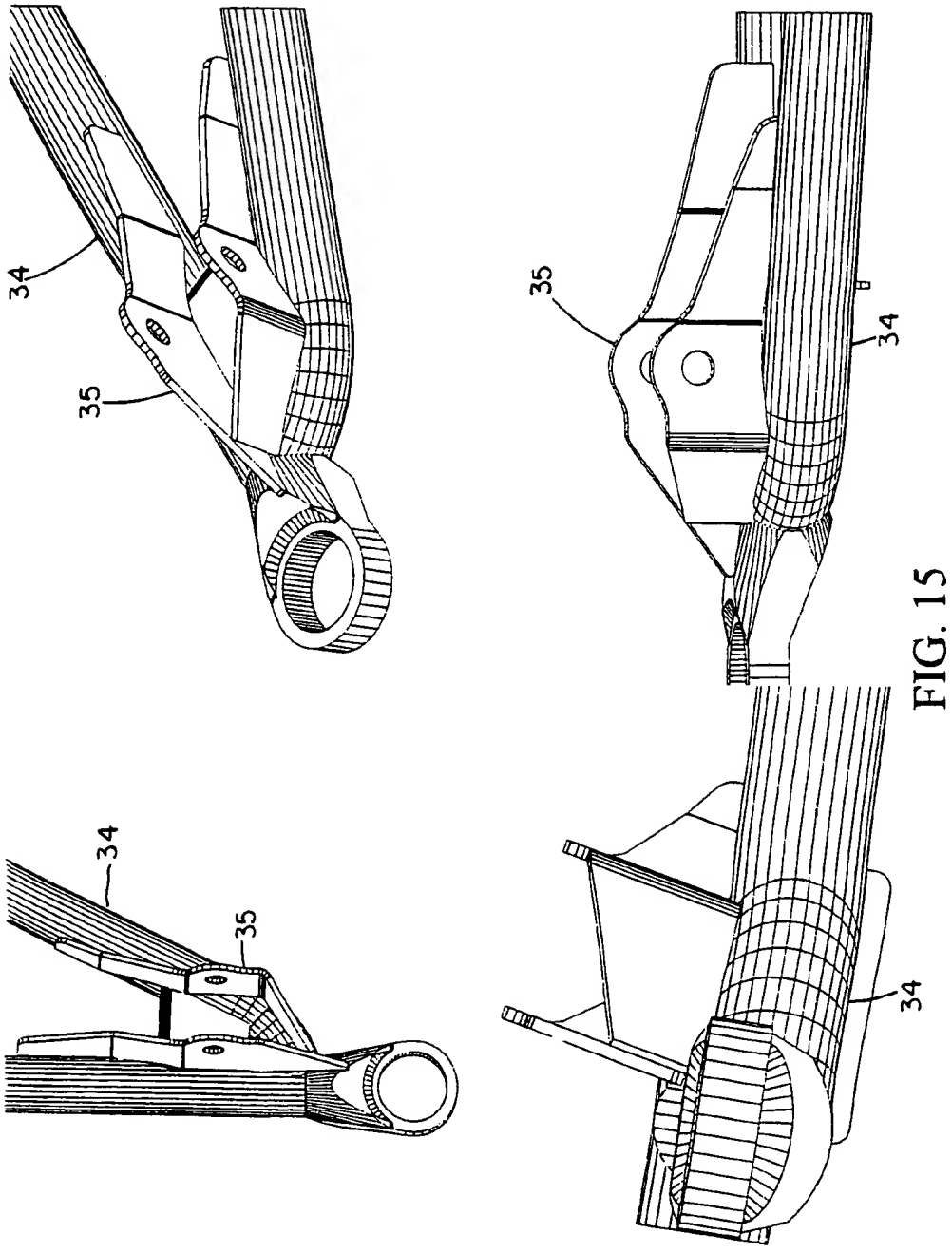

FIG. 15

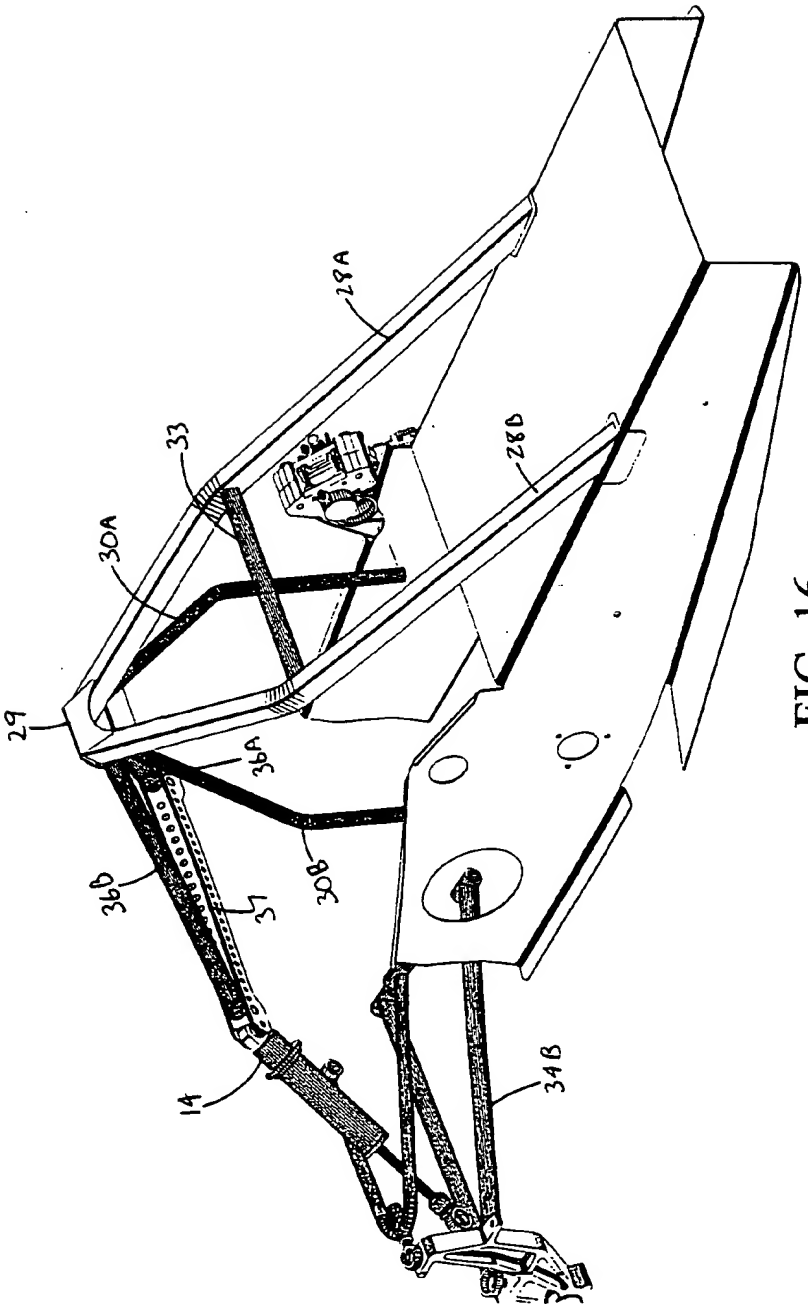

FIG. 16

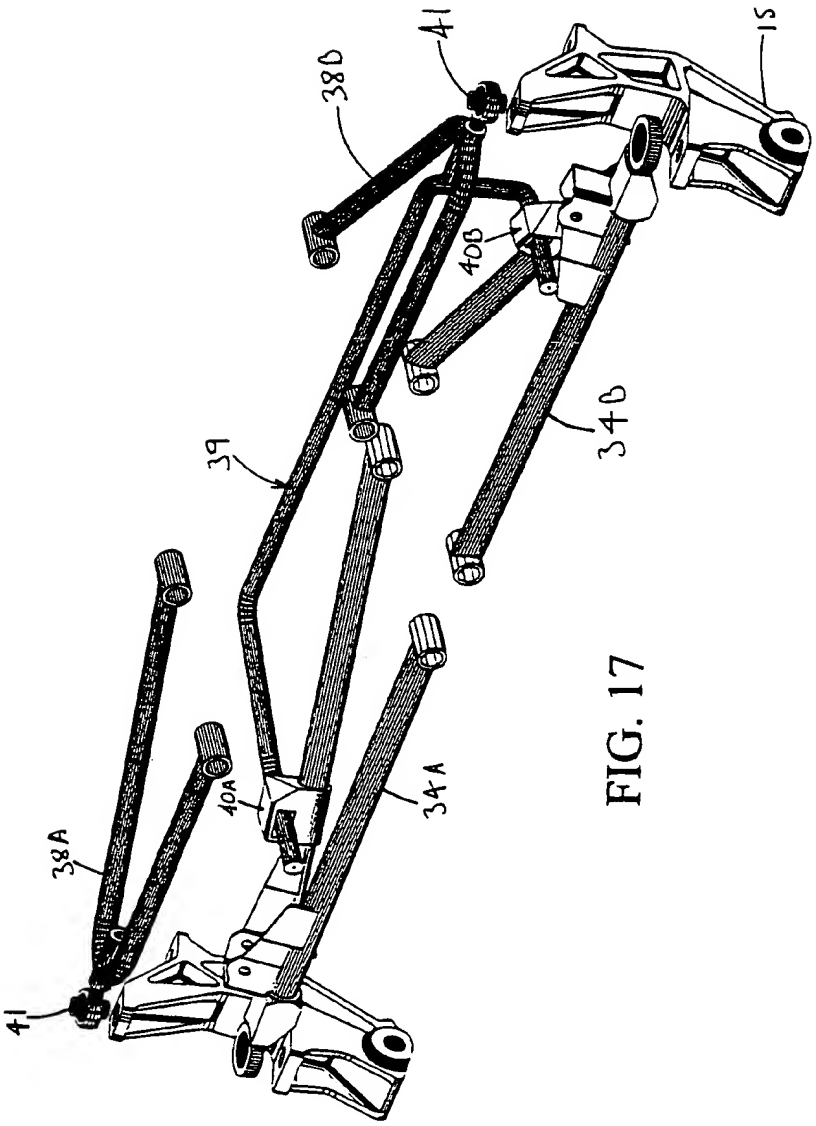

FIG. 17

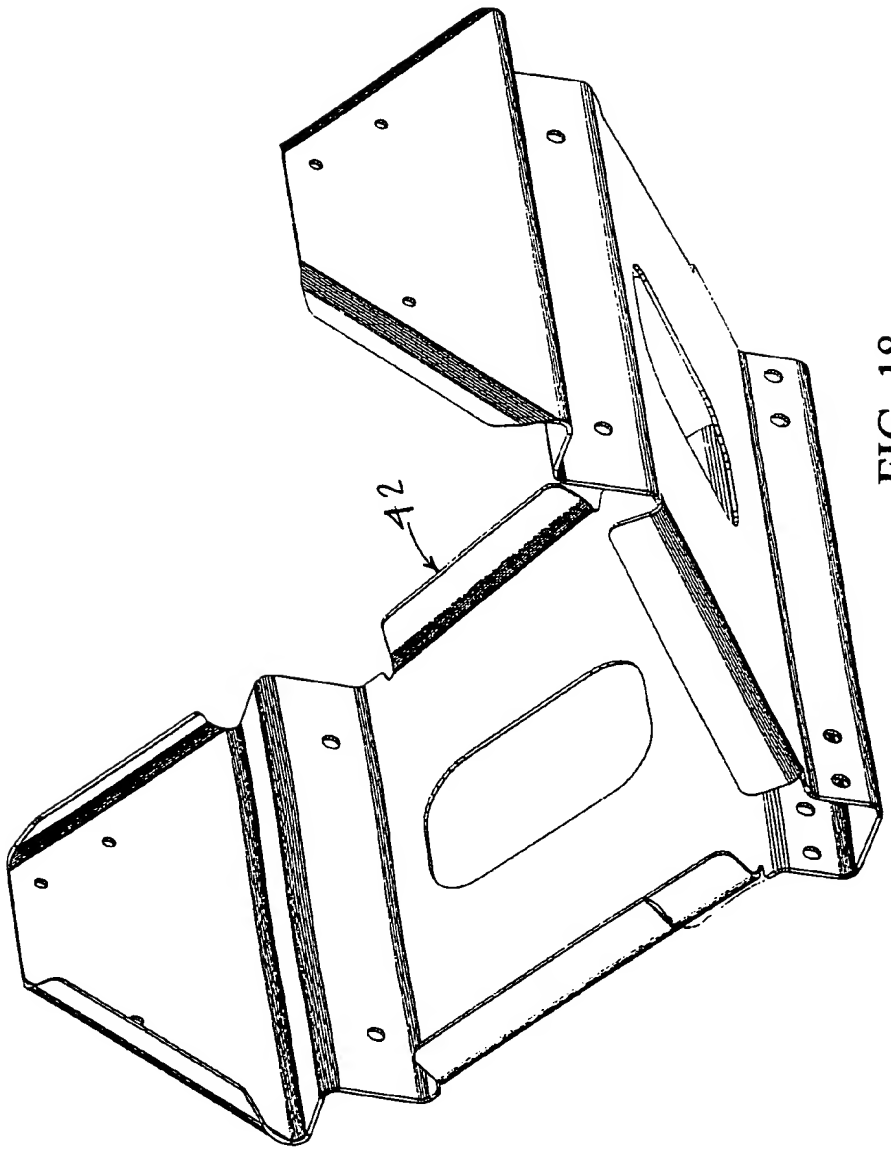

FIG. 18

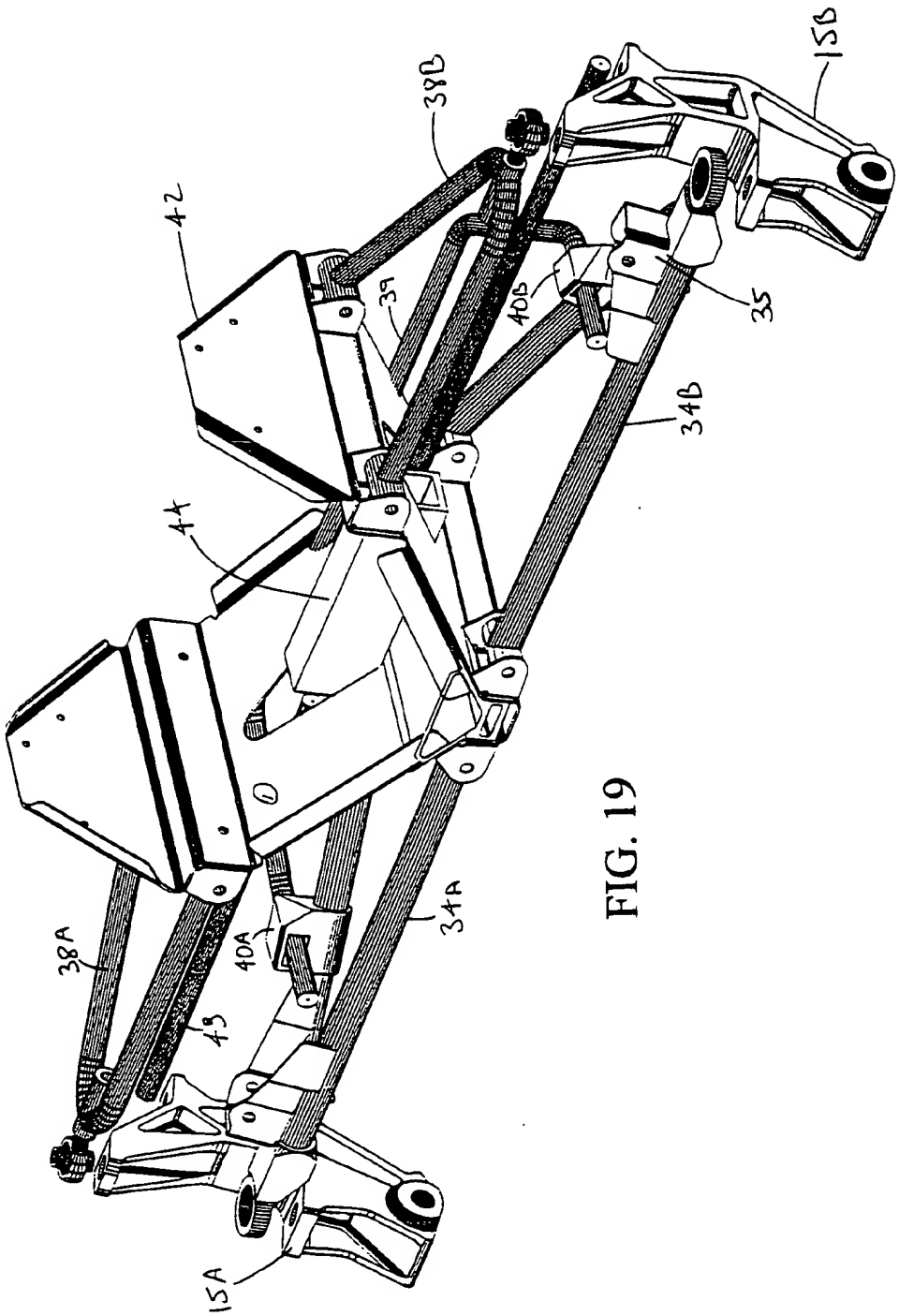

FIG. 19

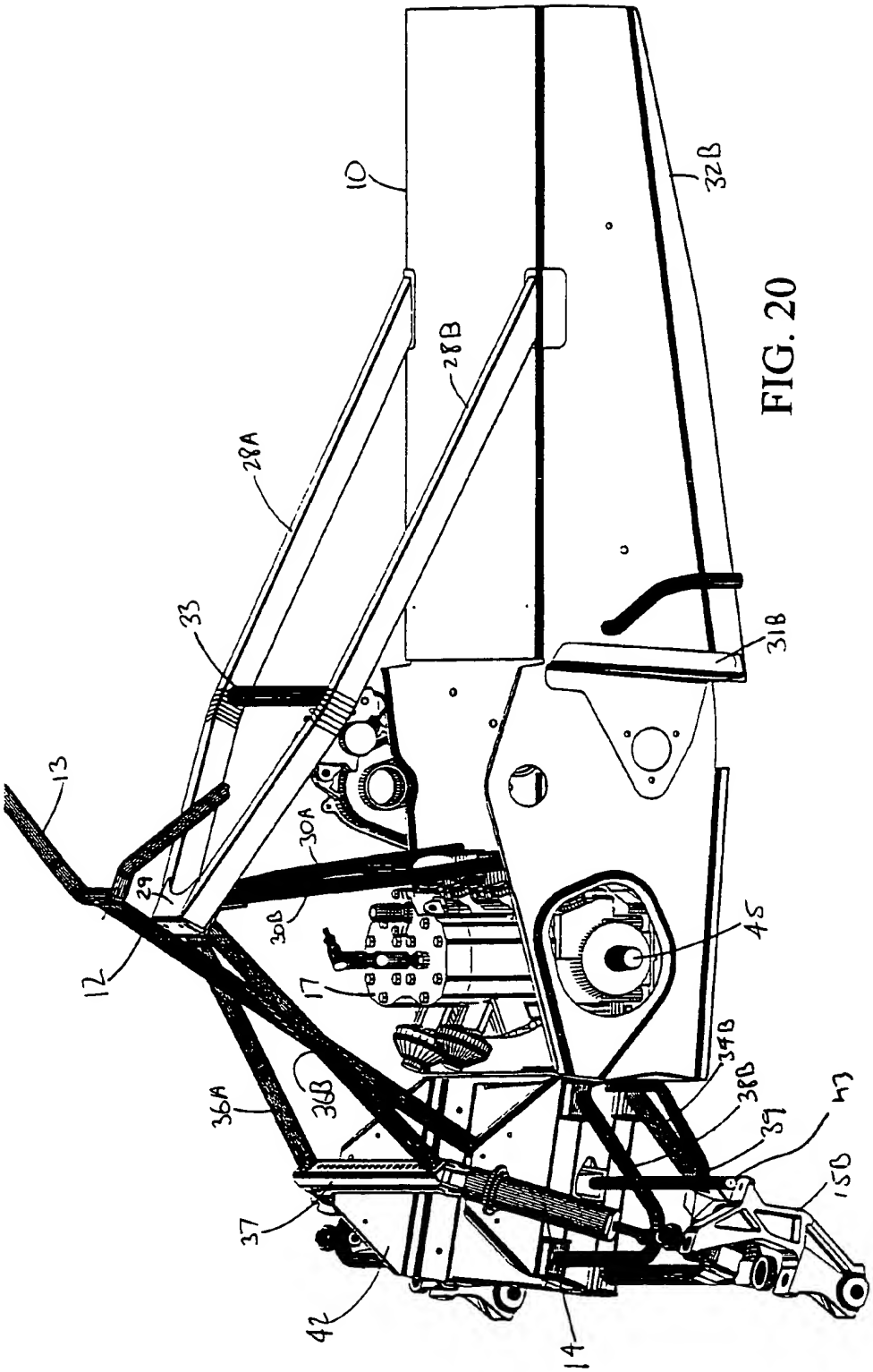
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FIG. 20

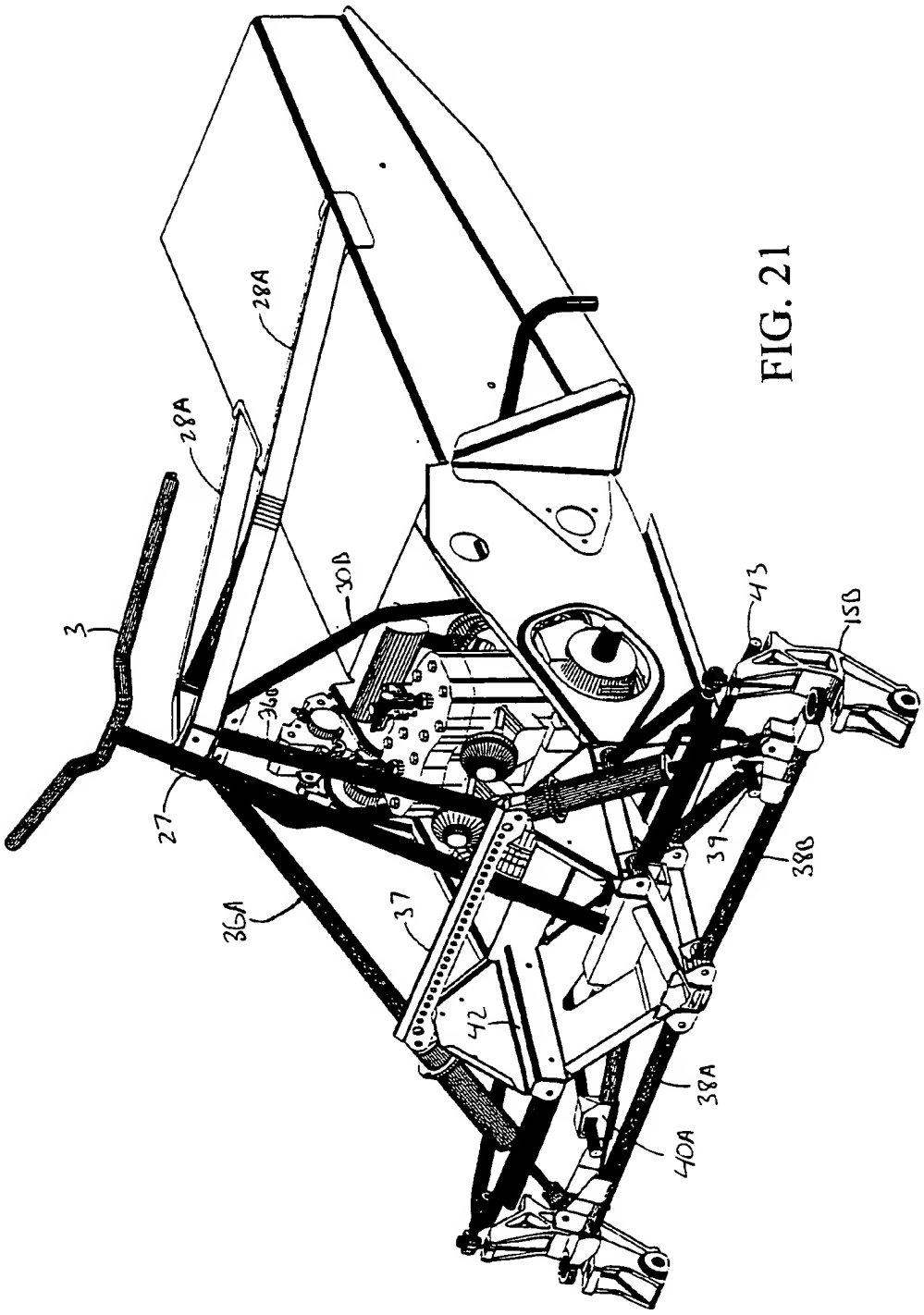

FIG. 21

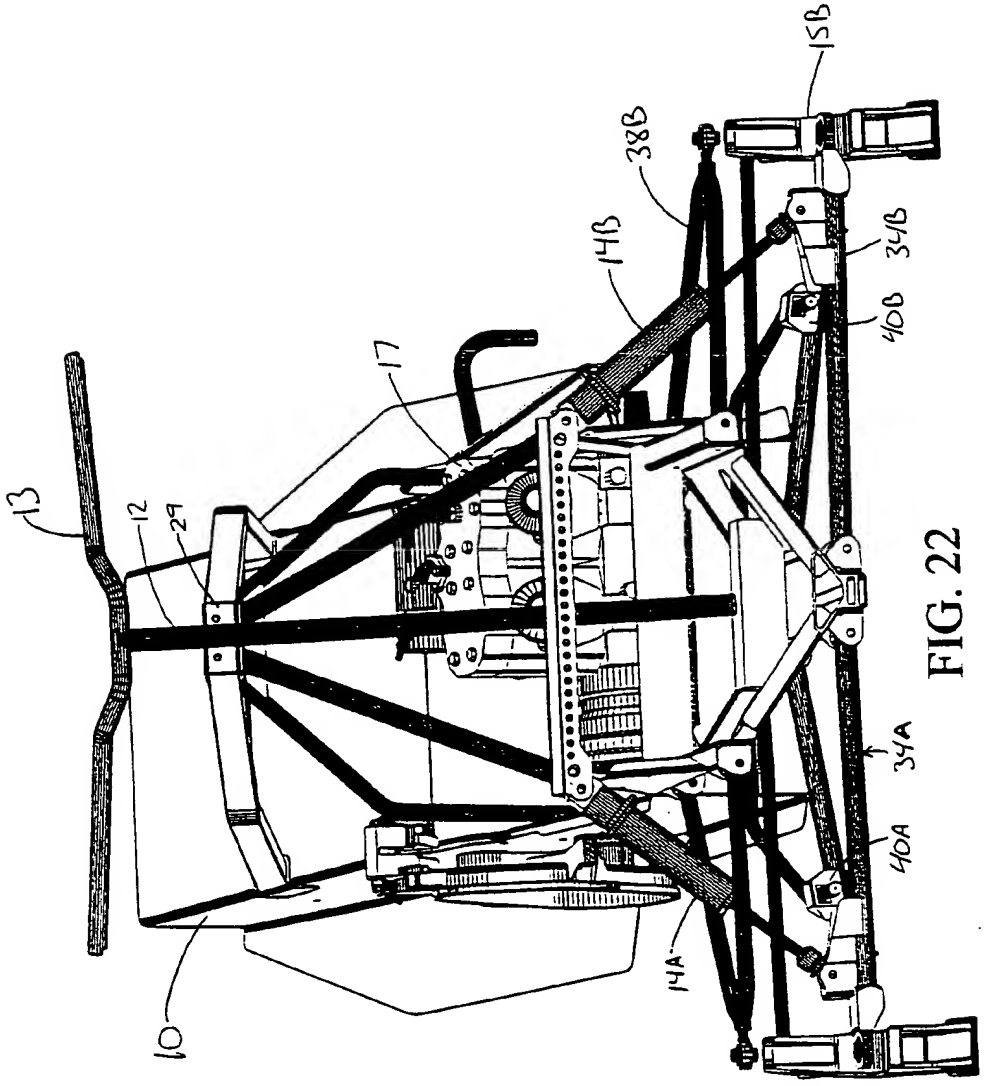

FIG. 22

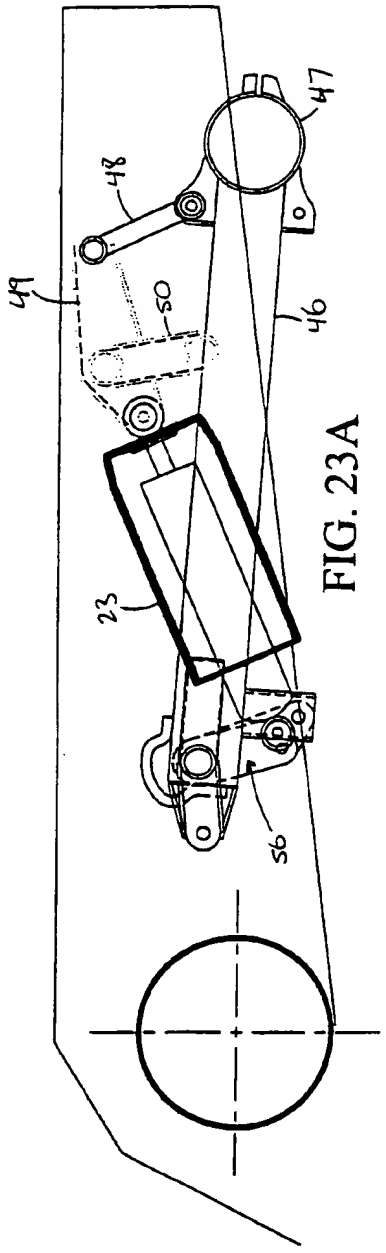

FIG. 23A

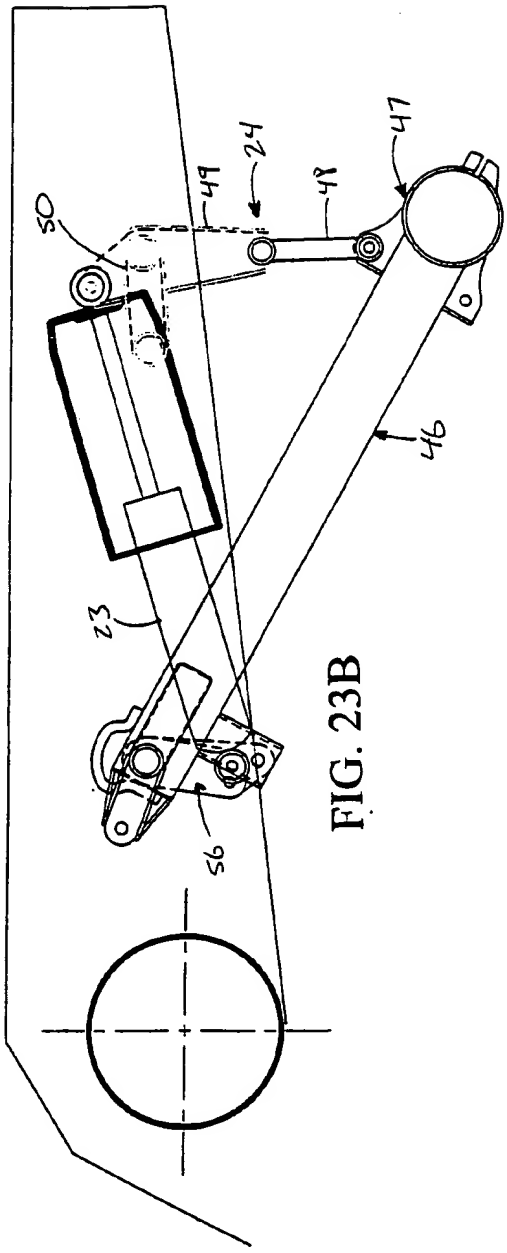

FIG. 23B

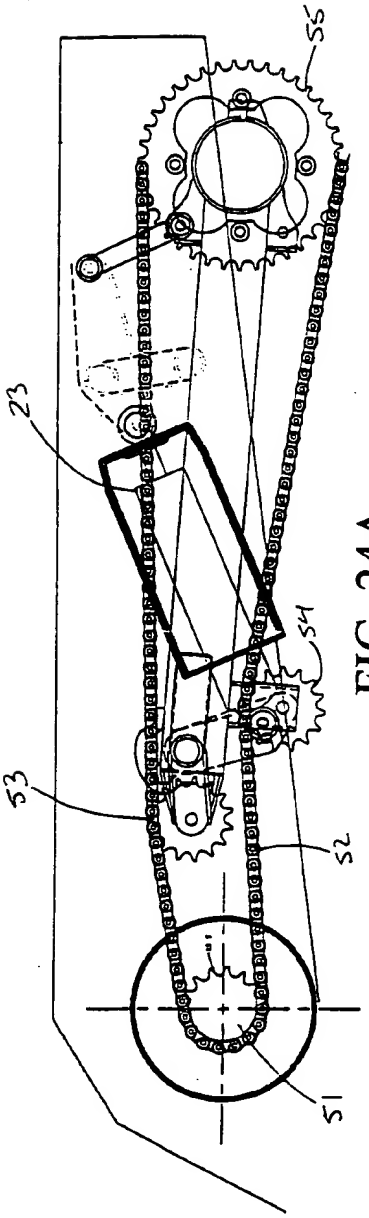

FIG. 24A

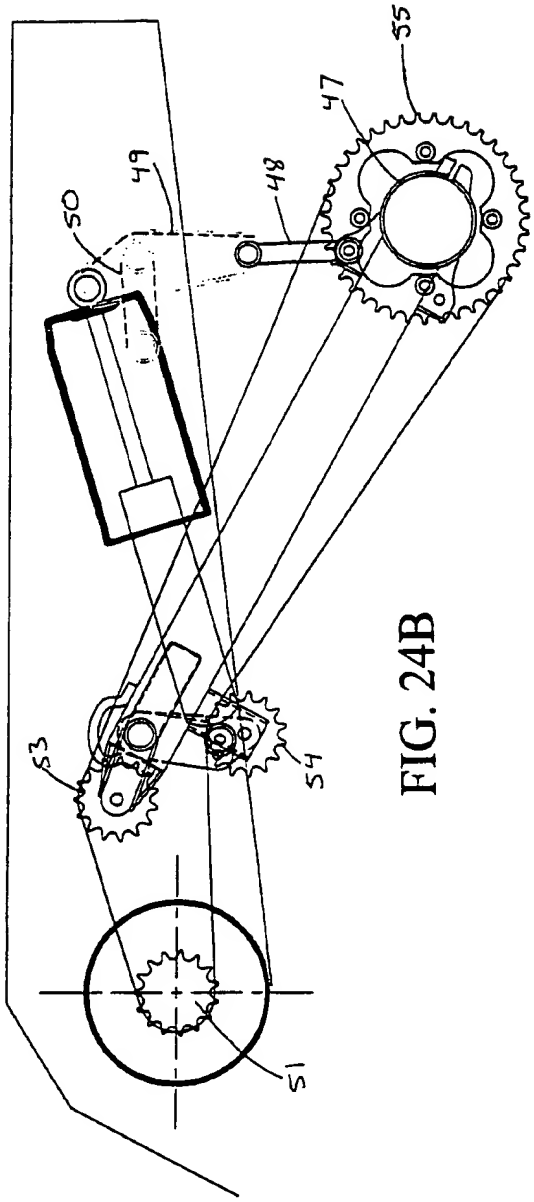

FIG. 24B

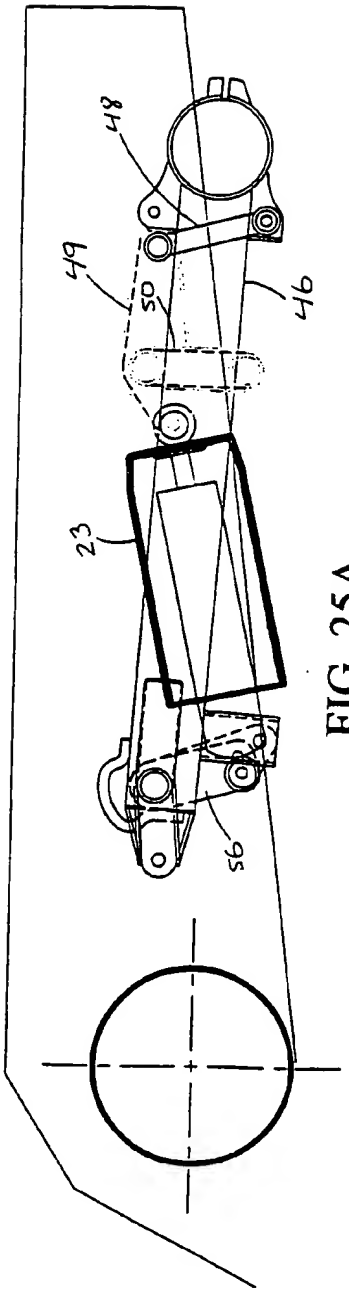

FIG. 25A

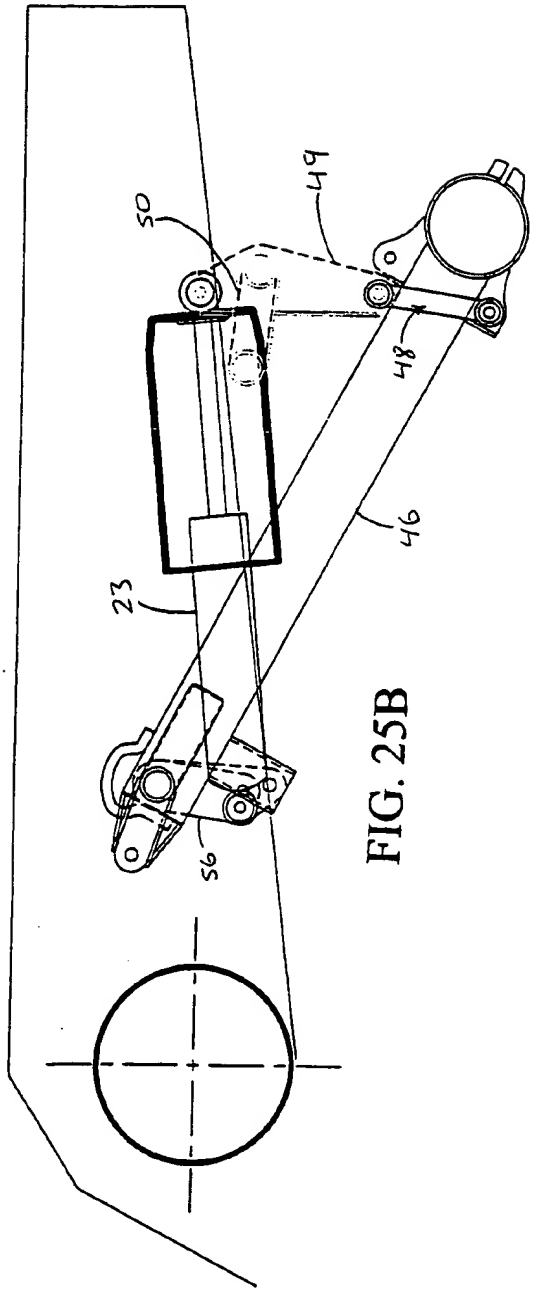

FIG. 25B

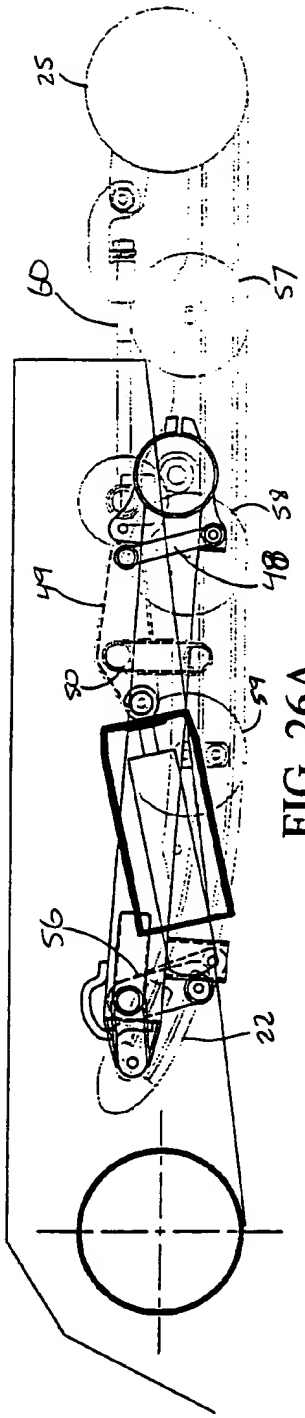

FIG. 26A

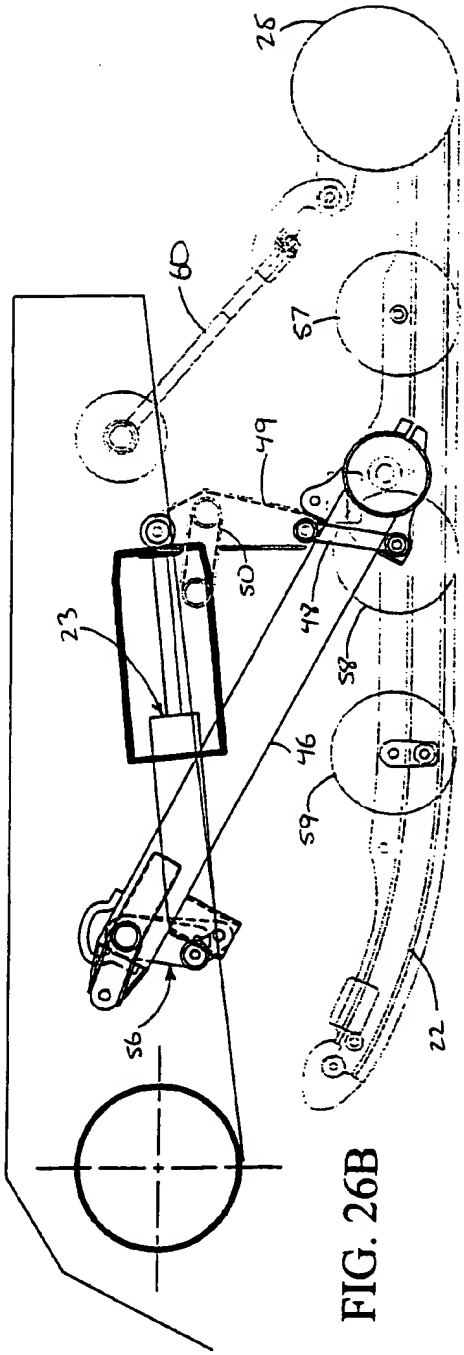

FIG. 26B

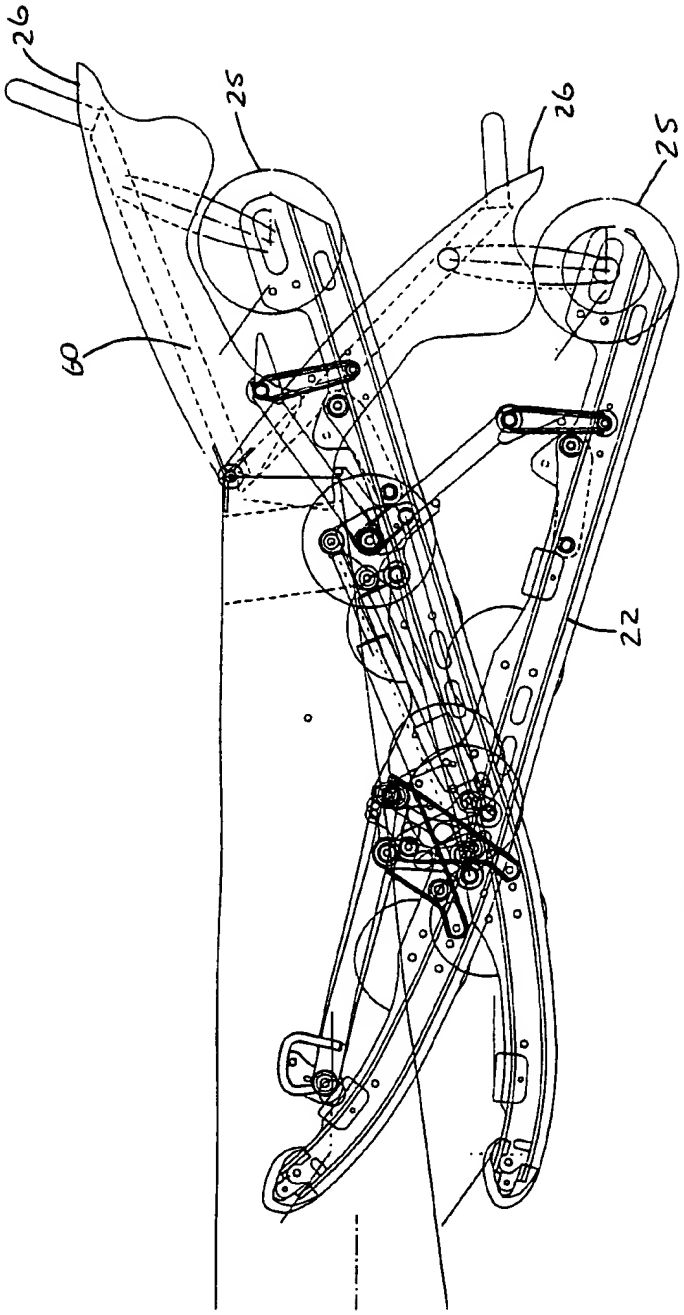

FIG. 27

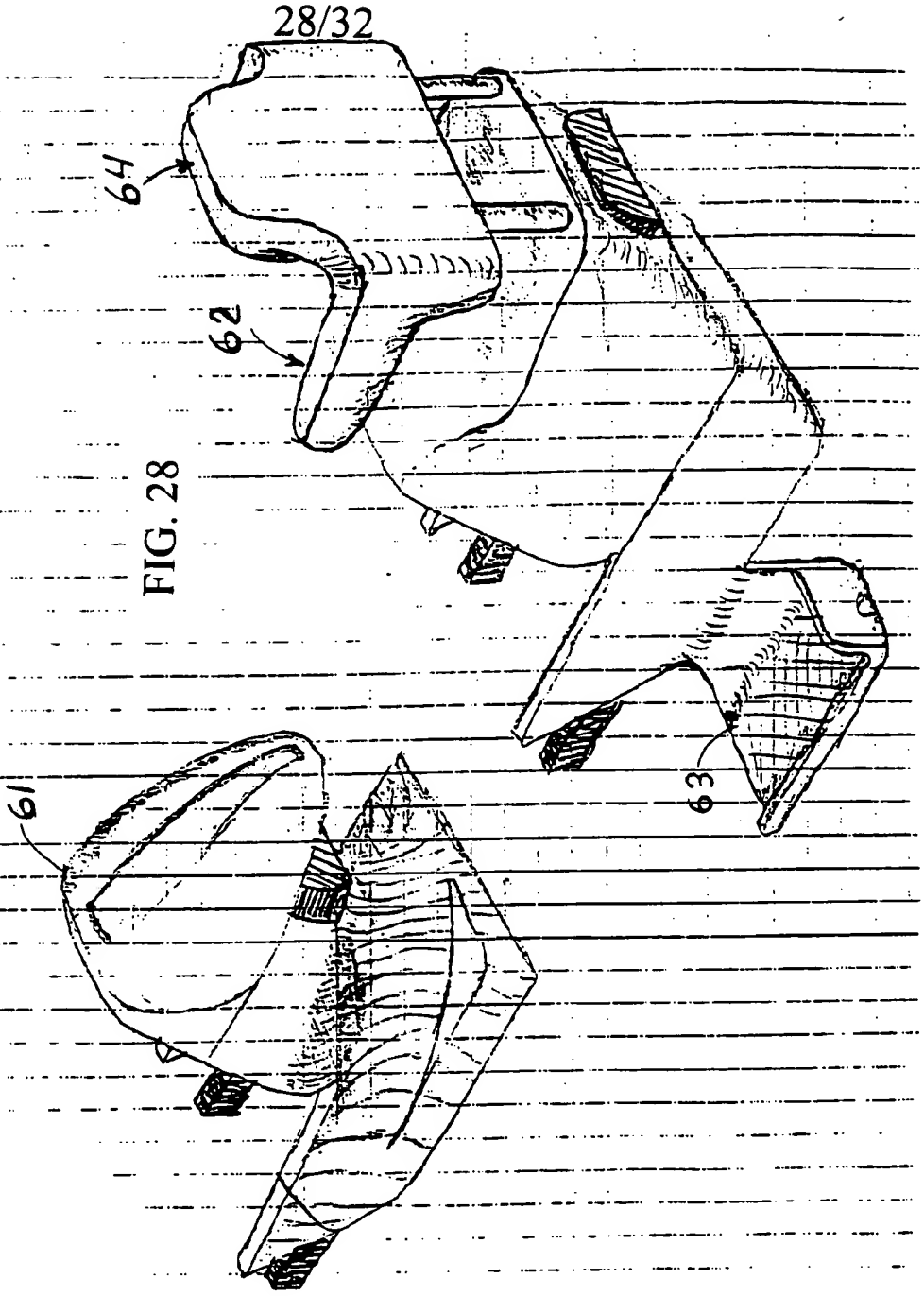

FIG. 28

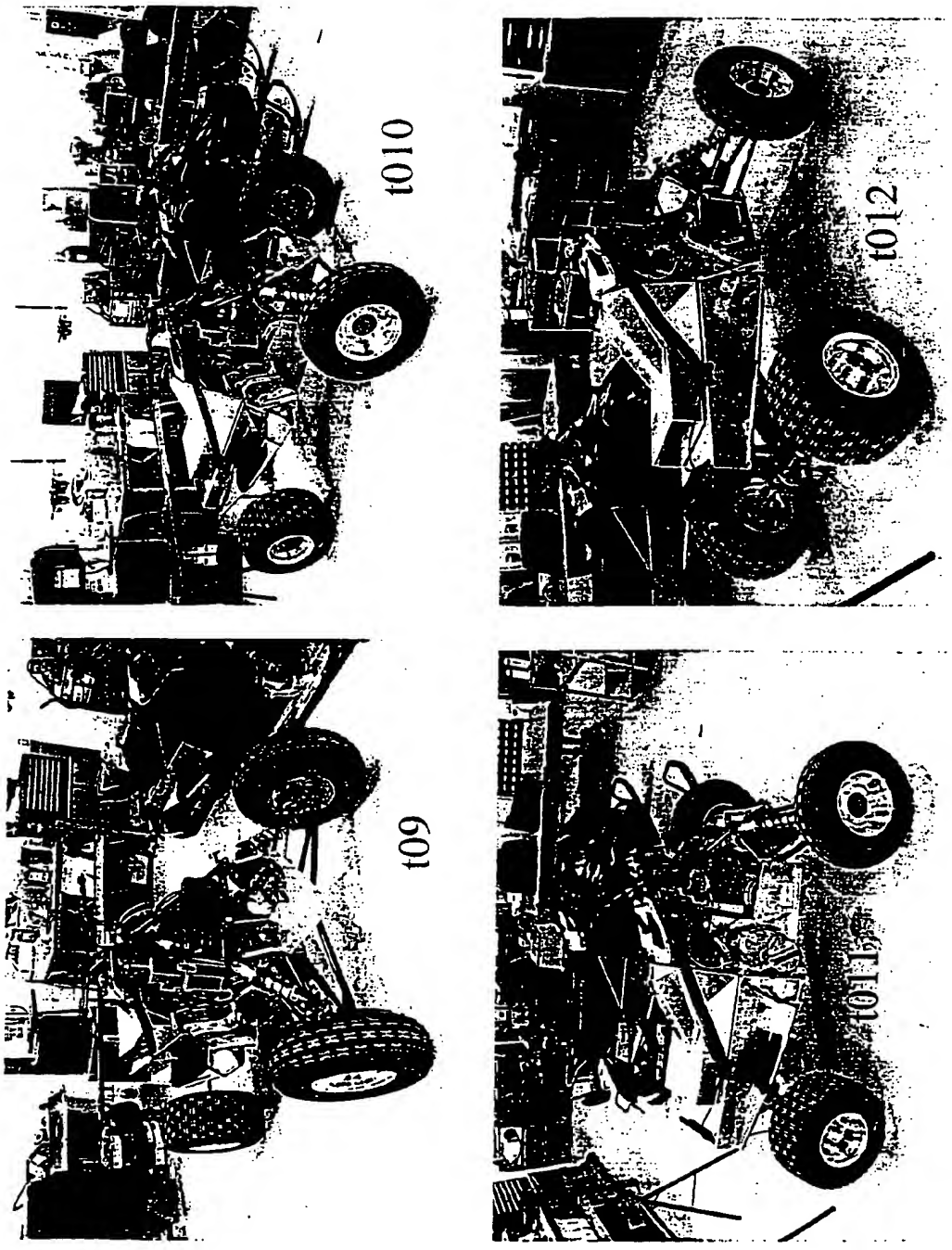

FIG. 29

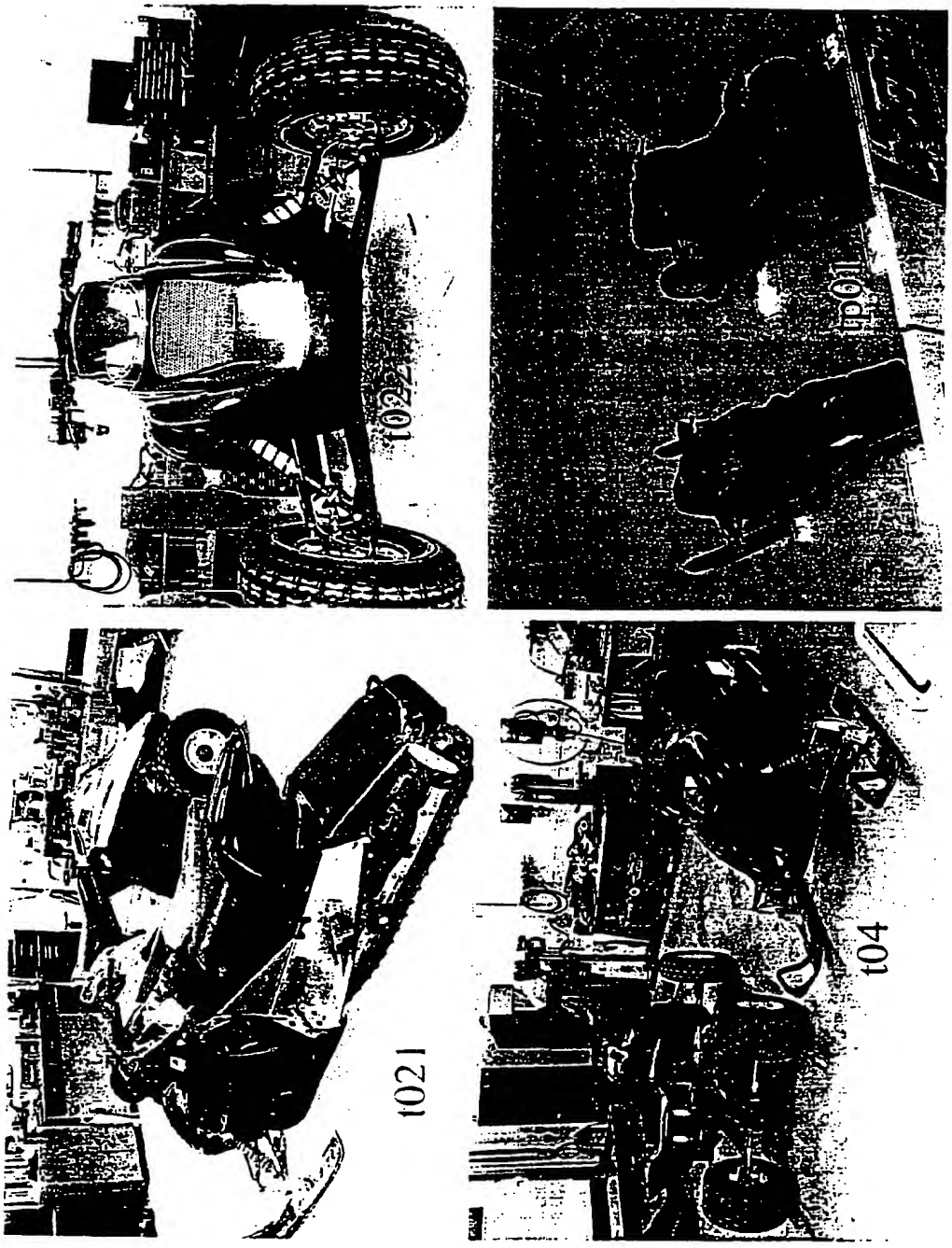

FIG. 30

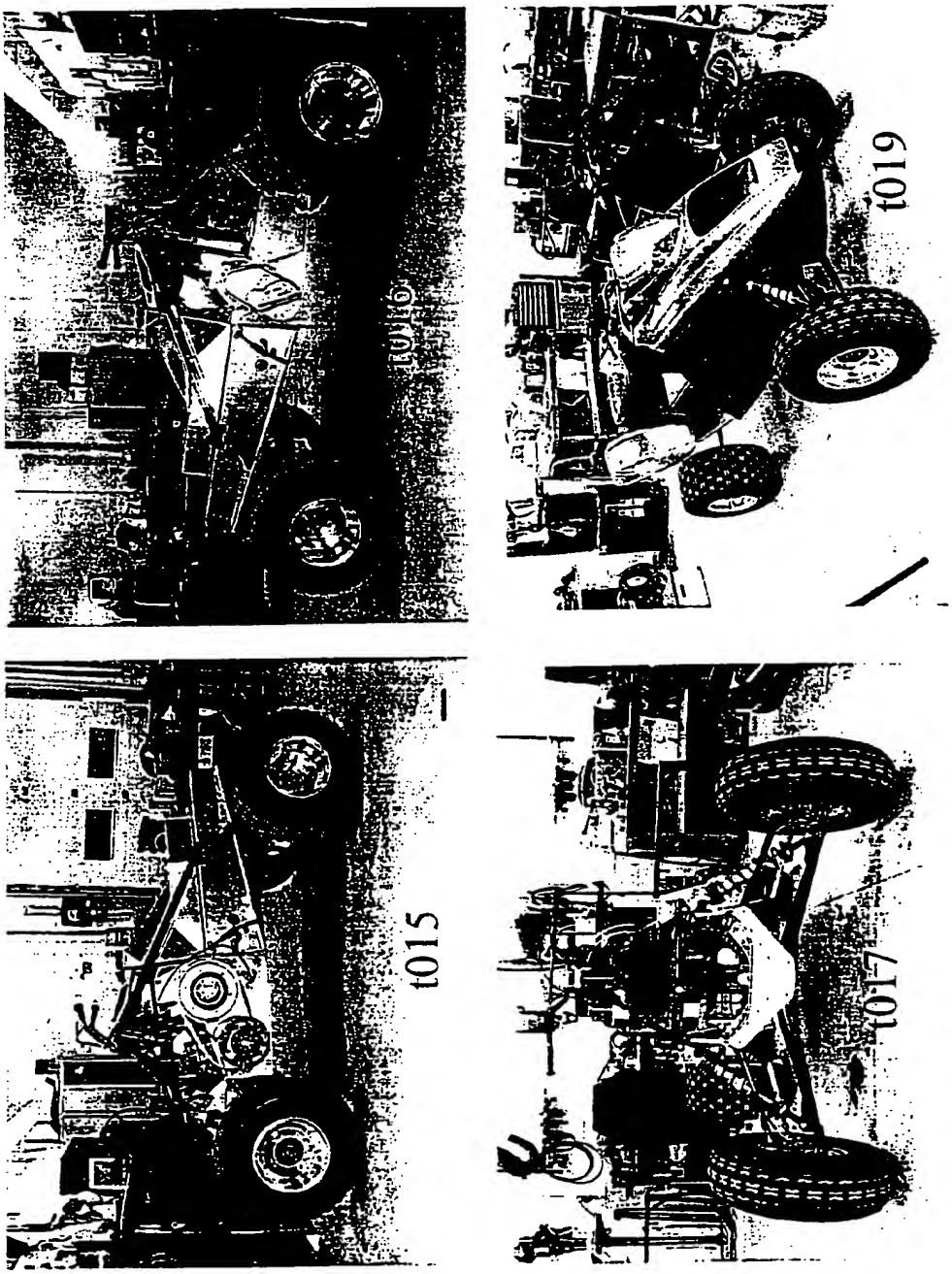

FIG. 31

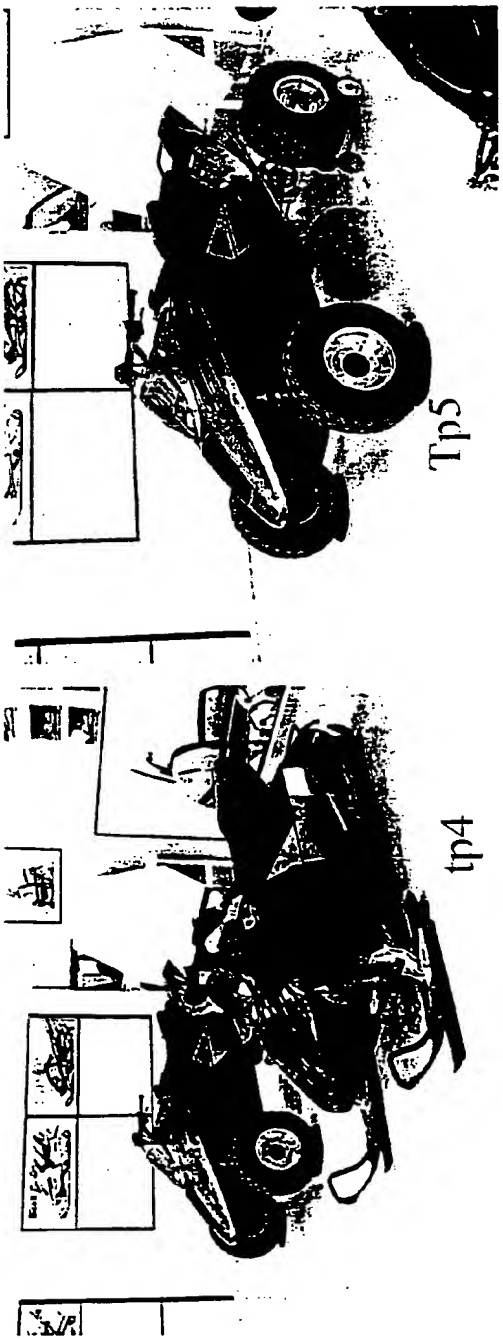

FIG. 32